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**Multi-Tiered Systems of Support in Medical Education**

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of Philosophy in Education**

**by  
Ranna Nash**

**Dr. Shanon Taylor/Dissertation Advisor**

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We recommend that the dissertation  
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**Ranna Nash**

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**Doctor of Philosophy**

Shanon Taylor, Ed.D.

*Advisor*

Rachel Salas, Ph.D.

*Committee Member*

Tammy Abernathy Vineyard, Ph.D.

*Committee Member*

Stephen Rock, Ph.D.

*Committee Member*

Amy Smith, Ph.D.

*Committee Member*

Kevin Facemyer, Ph.D.

*Graduate School Representative*

Markus Kemmelmeier, Ph.D., Dean

*Graduate School*  
December, 2023

## **Abstract**

Medical school is challenging for all with some of the most intelligent individuals in the world who have hopes of being healers. For medical students with disabilities this path can be extra challenging. This exploratory qualitative case study looked at a piloted student support model modeled from the K-12 Multi-Tiered Systems of Support (MTSS) by reviewing the experiences of 10 medical students who described their experiences with the support model. These students are also students with disabilities. Overall, the students indicated that having a designated support person to support them during medical school was beneficial in their path throughout their four-year program. Other themes identified included stigma, difficulty with required testing, and lack of understanding of the support model.

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make you proud by sharing your stories and that proper support regardless of need helps everyone succeed.

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## Chapter One

Support models in medical education that not only support students on a continuum but support all students regardless of need is not a common model found in medical schools (Steger-Jager et al., 2017). Higher education, graduate education, and medical education could utilize already thoughtful models of support from the K–12 system such as Multi-Tiered Systems of Support (MTSS). The introduction of a K–12 model in medical education is a process that has not been widely implanted nor has support-model success been documented in medical education research literature (O'Neill et al., 2011). This study offers an analysis of the tiered support model, which differs from other methods of providing educational support to medical students and fills in the gaps in the current literature regarding supporting struggling medical students (O'Neill et al., 2011). The purpose of the study was to look at student progress within the implementation of the MTSS model. This chapter introduces the background and research questions for this study.

The purpose of this case study was to describe and discover the benefits of implementing the MTSS model in medical education for medical students, with the focus on those with disabilities, at a Nevada medical school. Currently in medical school education, the medical student support models are defined as “remediation programs,” which are programs that address one of the themes O’Neill et al. (2011) identified, which is academic difficulty among medical students. Knowledge generated from this study could possibly inform those supporting medical students on how to best support all learners, specifically supporting students with disabilities to have universal access to their education.

## **Background of the Study**

In 2014, the Association of American Medical Colleges (AAMC) found that from 1970 to 2010, the 4-year graduation rates for medical students dropped from 90% to 81%. Historically, medical students' graduation rates have been high; however, there has been a reduction in graduation rates over the past decades and an increased need to extend medical school timelines (AAMC, 2014). Students with disabilities tend to extend their medical program requirements (Meeks & Herzer, 2016; Searcy et al., 2015). Therefore, it is crucial to understand their unique needs to be able to persist in medical school.

It is not surprising that medical school is known for being very demanding, and with that demand, many end up struggling and often withdraw or drop out of the program. The road to medical school begins with students applying through the AAMC, which houses student data and produces reports to inform medical educators (AAMC, 2014). The AAMC published a report in 2014 discussing graduation rates and attrition factors for U.S. medical schools. From 1970 to 2010, the 4-year graduation rates dropped from 90% to 81% (AAMC, 2014). Investigating the reason behind the increase in attrition rates will allow educators to better support student success throughout their medical education. In recent years, there has been an increase in diversity efforts, thus increasing the diversity of learners, including those with disabilities.

The current prevalence of students with disabilities in medical school has increased over the years and is a relatively new literature topic. Studying medical students' performance with disabilities is unique and requires a better understanding of the prevalence and categories of disabilities (Meeks, 2016). Even though recent studies have investigated medical school disability rates, it remains unclear how many medical students have disabilities. The prior estimates of medical students with disabilities are out of date (Meeks & Herzer, 2016). The

previous studies also speak primarily to physical disabilities and have not evaluated psychological, learning, and chronic health disabilities (Meeks & Herzer, 2016). A survey by Meeks & Herzer in 2016 assessed the prevalence of all disabilities and accommodations in eligible U.S. allopathic medical schools. Prior studies to 2016 indicated 0.3% to 0.6% prevalence of medical students with disabilities (Kezar et al., 2019; Meeks & Herzer, 2016). To a more recent majority of 2.7%, an estimate includes students with learning and psychological disabilities (LDs and PDs, respectively; Kezar et al., 2019; Meeks & Herzer, 2016; Meeks et al., 2019). Given the previous surveys, the prevalence numbers could be underreported, especially because there is still a stigma surrounding PDs (Meeks & Herzer, 2016). As a reminder, schools are under a federal mandate to document communication and decision-making regarding students with disabilities to support these data (Meeks & Herzer, 2016). By having proper contacts, better documentation for students with disabilities will occur, and prevalence studies can be more accurate because of the reported prevalence in 2016 and a call for action by the AAMC in 2018 to be more inclusive of learners and physicians with disabilities (PWD).

Further justification of representing people with disabilities is indicated in diversity literature through reported improved health outcomes, medication adherence, and communication due to physician–patient concordance in race, ethnicity, and language (Meeks, Herzer, et al., 2018). The diversity literature indicates that near-peer relationships with individuals with disabilities and improved education about disability are relatively essential for medical students and other trainees (Meeks, Herzer et al., 2018). The barriers found for medical students and residents with disabilities have predominately two types: structural and those that stem from an institution's culture and climate (Meeks, Herzer et al., 2018). The first structural barrier could consist of restrictive or outdated policies and procedures (Meeks, Herzer et al.,

2018). The second structural barrier is a poor understanding of clinical accommodations (Meeks, Herzer et al., 2018). The last structural wall combines the lack of disability and wellness support services and a physical environment that limits accessibility (Meeks, Herzer et al., 2018). These barriers have very immediate, specific, and practical implications for trainees needing access (Meeks, Herzer et al., 2018). More research must be done about students with disabilities in medicine.

Since 2016, there has been an increase in the prevalence of medical students with disabilities. Meeks et al. (2019) found that most disabilities increased from 2.7% to 4.6%, which is a 69% increase in students' self-disclosing disability status. There is a possibility that the increase in disability prevalence may result from more applicants with disabilities being admitted to medical school or that more students are disclosing their disability (Meeks et al., 2019). The AAMC also requires for medical schools to have their graduating students fill out a survey called the Graduation Questionnaire (GQ) in which there are a series of questions asking if students identify having a disability. This new aspect of the GQ was implemented with the graduating Class of 2022. Through the GQ data there was a reported 13.8% of medical students who disclosed having a disability which shows the increase of student disclosure (AAMC 2023 Sample survey).

Including individuals with disabilities can and should be essential to medicine. Better support can be had for patients with disabilities (Meeks et al., 2019). Although an increase in disability is observed, there must still be narrative data to aid in information about the culture these students experience or their retention in the training and career pipeline (Meeks et al., 2019). Therefore, further research is needed to increase current documentation to show representation, which is a first step toward enhancing persons with disabilities within the medical

school environment (Meeks et al., 2019). Data to consider examining include the academic and career performance trajectory of learners with disabilities, identifying which supports and accommodations are most effective for learners with various disabilities, increasing the collective understanding of the experiences of persons with disabilities in residency and their subsequent employment, and examining the impact of PWD on patient care (Meeks, Herzer et al., 2018).

### **Significance of the Study**

The significance of the study was to demonstrate that proactive support programs like MTSS can help support all medical students along with those entering with disabilities. Implications from this study will inform best practices in supporting all students while understanding how to better support students with disabilities to be successful in medical school within the same timeline as other students.

The rationale for this study was the interest in expanding research on what best supports medical students, appropriate interventions, and how to continue to report best practices to support medical students with disabilities, because currently the literature is lacking. This research will be impactful in developing a well-structured proactive program that has evidence-based practices to support medical students individually and allow for change to happen to increase representation of practitioners in medicine.

### **Purpose Statement**

The purpose of my dissertation was to understand the persistence of medical students with disabilities and how to best support these students along with all students. The study was an exploratory qualitative case study that examined a number of medical students who have gone through the pilot MTSS program at a Nevada medical school. The student size was 10 students.

Student progress data throughout the years (grades and years completed), whether students extended their education, and interview feedback were integrated to look at the benefits behind having an MTSS model.

### **Definitions of Key Terminology**

This study used a variety of terms; a few key terms are included as follows:

**Disability-** impairment or limitation of one's day-to-day life (Rastogi, 2021)

**Dropout-** not completing current education (O'Neill et al., 2011)

**K-12-** precollege education (McIntosh & Goodman, 2016)

**Medical College Admissions Test (MCAT)-** required for all students entering medical school (Searcy et al., 2015)

**Medical Education-** graduate education for students who are training to be doctors (AAMC, 2022)

**Multi-Tiered Systems of Support-** MTSS aids in the prevention of academic and behavioral difficulties through high-quality, research-based core instruction provided to all students (McIntosh & Goodman, 2016)

**Remediation Programs-** Remediation programs are offered to medical students in training who underperform throughout their medical education (Cleland et al., 2013)

**Student Support-** programs that provide tutoring, mentoring, counseling, coaching, and study skills (U.S. Department of Education, 2022)

**United States Medical Licensing Exam (USMLE) (Step 1 and 2)-** While in medical school, students are required to take and pass the USMLE, which consists of three parts: Step 1, Step 2 Clinical Knowledge (CK), and Step 3 Clinical Skills (CS), which are needed for students to pass and match into residency (Searcy et al., 2015).

**Learning Styles-** different types to aid in students' efficient learning (Rasmussen, 2020)

**Self-Regulated Learning-** working with students to be good self-regulated learners, which correlates with higher academic performance (Gandomkar et al., 2016; Patel et al., 2015)

**Universal Design (UD)-** UD shows flexibility to include all learners from the very beginning (Scott et al., 2003)

## **Rationale**

The rationale in using a program like MTSS was to show that already well-established K–12 programs can be beneficial in other types of education. By knowing the students' entering types of education, those invested in student success can better help students. Given the gaps of measures, processes, and especially supports for students with disabilities, this model can supplement these areas to mend the gaps.

## ***Applying Model to the Study***

I examined the MTSS model's implementation and effect it had in supporting students, specifically those with disabilities. Chapter 2 synthesizes literature about the current increased prevalence of students with disabilities in medical education, introduces the MTSS model in K–12 education and its effectiveness, and discusses how the model can be implemented into medical education.

## **Conclusion**

MTSS could be a valuable support model for students in medical education. Given the gaps of literature and the fact that more students from diverse backgrounds are coming into medical education, the MTSS model can pave the path for a more diverse workforce to eventually aid in health disparities. This dissertation is organized by showing the gaps in literature and how MTSS can address these gaps. I offer an explanation of this exploratory

qualitative case study, which indicates the benefits and limitations of an MTSS model in medical education. I also present the results and discuss future research possibilities. Chapter 2 continues to identify the gaps in literature of current support models and literature that shows the increase of students with disabilities in medicine.

## Chapter Two

Graduate programs are rigorous and medical school is even more rigorous by having high expectations that students must achieve. In medical school, students must sign off on a school's technical standards when they are admitted and ultimately when they are approved for graduation. The wording of "technical standards" comes specifically from the Rehabilitation Act of 1973, and they are defined as nonacademic admissions criteria that are essential to participation in the program in question (Kezar et al., 2019). Medical students must meet the needs of patients. There is a large amount of testing in medical school across many formats (standardized, multiple choice, and CS). Technical standards can often limit entry for students with disabilities and create barriers when students are in school.

This chapter reviews the current state of literature for individuals with disabilities, describes examples, examines current practices for supporting medical school students, and compares current practices to a K–12 educational model for students with and without disabilities. Although there is some research on undergraduate programs for students with disabilities, there is much less research on programs that support graduate students. Most support programs in higher education are provided primarily for undergraduates (Barnhill, 2016; Viesel et al., 2020). For example, Viesel and colleagues (2020) found that in support programs specifically for students with autism spectrum disorder, 93% of the support was provided to undergraduate students, leaving only 7% of support towards graduate students. Disabilities, however, do not stop when students enter graduate school, which includes medical schools. Finally, by referring to K–12 educational systems, higher education can implement support programs that can better assist students with disabilities, such as the well-developed MTSS model.

## **The Changing Demographics of Medical Education**

In 2014, the AAMC found that from 1970 to 2010, the 4-year graduation rates for medical students dropped from 90% to 81%. Historically, medical students' graduation rates have been high; however, there has been a reduction in graduation rates over the past decades and an increased need to extend medical school timelines (AAMC, 2014). Students with disabilities often tend to extend their medical program requirements (Meeks, 2016; Searcy et al., 2015). Therefore, it is crucial to understand their unique needs so they may succeed in medical school.

It is not surprising that medical school is known for being very demanding, and with that demand, many students end up struggling and often withdraw or drop out of the program (Maher et al., 2013). The road to medical school begins with students applying through the AAMC, which houses student data and produces reports to inform medical educators (AAMC, 2014). Investigating the reason behind the increase in attrition rates will allow educators to better support student success throughout their medical education. In recent years, there has been an increase in diversity efforts (Maher et al., 2013), thus an increase in the diversity of learners, including those with disabilities (National Center of Education Statistics, 2021). The current prevalence of students with disabilities in medical school has increased over the years and is a relatively new literature topic (Meeks et al., 2019). There is a need for representation of this population in the student population, teaching in medical schools, and those practicing medicine.

To further justify the representation of people with disabilities in medical school, diversity literature indicates there are reported improved health outcomes, medication adherence, and doctor/patient communications with a more diverse medical provider pool due to physician–patient concordance in race, ethnicity, and language (Meeks, 2018). The diversity literature

indicates near-peer relationships with individuals with disabilities and improved education about disability are relatively essential for medical students and other trainees (Meeks, 2018). More research must be done about how students with disabilities are included in medicine.

By viewing individuals with disabilities as essential to medicine, better support can be provided for patients with disabilities (Meeks et al., 2019). Although an increase in students with disabilities in medical school has been observed, there must still be narrative data to aid in information about the culture these students experience or their retention in the training and career pipeline (Meeks et al., 2019). Therefore, further research is needed to increase current documentation to show representation, which is a first step toward enhancing visibility of persons with disabilities within the medical school environment (Meeks et al., 2019). Factors to consider might be looking at the academic and career performance trajectory of learners with disabilities, identifying which supports and accommodations are most effective for learners with various disabilities, increasing the collective understanding of the experiences of persons with disabilities in residency and their subsequent employment, and examining the impact of PWD on patient care (Meeks, 2018).

### **The Need for Support Programs in Medical Education**

Before discussing how a new system of support can be designed and implemented into medical education, it is essential to understand the literature of current student support models—or the lack thereof—in medical education. One data point that could be used would be the current medical student failure or dropout rate. Small studies have been done to better understand medical student dropout.

O'Neill et al. (2011) conducted a systematic review of the literature to examine factors associated with medical school dropout. Out of 625 studies searched, only 13 reviewed studies

addressed the required search criteria, which were bound within four domains (study population must consist of that of medical students, dropout was filtered as the only outcome, there was a follow-up period of greater than 1 year, and a case-control or experimental design study was conducted on the cohort; O'Neill et al., 2011). The limited amount of specific literature on dropouts indicates that more research is needed to fit the medical student population's criteria, dropout rate, and follow-up data (O'Neill et al., 2011). The common theme found from the review associated with dropouts in medical school was entry qualifications, academic challenges, and possible psychological challenges (O'Neill et al., 2011). Medical students will continue to have stress issues as they go through medical school, yet there are few discussions with less training to help these students (Mancias & Bick, 2013) Finally, the literature review did not indicate outcomes from any educational support models that might prevent dropouts from happening.

Roughly 6–8% of medical students withdraw within their first year of medical school (Mancias & Bick, 2013). After the first year, the dropout rate reduces to 2–4% (Mancias & Bick, 2013).. Reasons for leaving medical school range from the most common being poor academic performance to health concerns or family needs (Mancias & Bick, 2013). Better research of these common themes could aid in the development of better support models. Lower entry qualifications have shown to have potentially led to higher dropout rates, yet reasons why are unclear. Few psychological variables were associated with dropouts and the research is insufficient (O'Neill et al., 2011). A study indicated 40% of their medical student population were likely to be experiencing a mental health condition, which correlated with isolation, failure, and despair (Maher et al., 2013). The fear of failure can cause depression in students, which could affect their progression in the curriculum and therefore interventions and solutions should

occur more quickly prior to failure (Mancias & Bick, 2013). Comprehensive casual models of dropout that include educational, organizational, and instructional influences must be tested to learn more about what might be done to prevent medical student withdrawal (O'Neill et al., 2011). A common theme (or red flag) for dropouts was academic struggles, absenteeism, and leave of absence (Mancias & Bick, 2013; Maher et al., 2013; O'Neill et al., 2011). Such knowledge could potentially benefit the education of all medical students. For example, retention of Black male medical students involved social support, education, exposure to the field of medicine, group identity, and social responsibility (Thomas et al., 2011). There is currently more literature on working with struggling medical students indicating the need for better structure and monitoring to help students of all backgrounds.

Currently, support programs are called “remediation programs” in medical education. Remediation programs tackle one of the themes O’Neill et al. (2011) identified: academic difficulty among medical students. Remediation programs as currently used are for students who are failing or in danger of failing. Before decisions about adaptations can be made, each medical school must resolve whether it is preferable to invest in students who may fail to finish medical school or dismiss students who may become good doctors. There is little understanding of factors that influence how individuals experience failure or make sense of remediation's failing experience. Three medical schools looked closer at students who failed their re-sit exams, which is the process by which students are required to retake specific course exams they have failed. An analysis showed complex interactions between academic and personal issues. Circumstances surrounding struggling students ranged from having educational issues; emotional issues (specifically finance and relationships); strained relationships with friends, family, or faculty; and various mental health problems (Patel et al., 2015). Management of remediation is an area

that can be looked at and analyzed to determine effectiveness. In one study, researchers used case studies with semi-structured interviews. Factors that affected the students were the emotional trauma of struggling and failing (Hayes, 2012). The students also expressed personal problems as inseparable from academic life (Hayes, 2012). Stress and vulnerability are commonly recognized among medical students as issues leading to course failure, requiring the need for remediation. Findings from the study suggest that both may be present in significantly high levels among students susceptible to repeated failure. The student may see remediation as judge and jury, a final decision rather than a support service. Remediation programs/courses need sole responsibility as remediation, rather than one oriented towards performance management and preparing a case for removing students from the course. Generic remediation programs may fail to meet students' needs for whom personal, social, and mental health issues are part of the picture.

Of the currently identified remediation programs, there has not been sufficient data to demonstrate successful student outcomes. Cleland et al. (2013) conducted a review of literature spanning 28 years of remediation programs that met the following criteria: remedial teaching; education, medical, undergraduate, or clinical clerkship; internship and residency; and at-risk and struggling students or learners. Out of the 2,113 studies searched, only 31 met the criteria to be part of the review. The purpose of Cleland et al.'s study was to look at remediation intervention literature to help progress knowledge of this topic, so specific student outcomes were not discussed (Cleland et al., 2013). However, effective remediation can be challenging, and the outcomes are usually uncertain (Durning et al., 2011). Because of this uncertainty and the frustration with piecemealed remediation programs, there has been a growth in literature on remediation in medical education (Chung et al., 2019). There has been a wide range of reported

success (from 77%–100%) of remediation programs; however, the definition of success is not clearly defined with the literature reporting only short-term outcomes (Chung et al., 2019). The more information gleaned regarding interventions for acceptable remediation practices, the better students can be supported. Remediation programs are offered to medical students in training who underperform throughout their medical education (Cleland et al., 2013). Though these programs exist, there is uncertainty about remediation effectiveness (Cleland et al., 2013).

Timely intervention for poor performance has the potential to enable the individual to deal with adverse learning and behavior patterns promptly before they cause problems in clinical practice (Cleland et al., 2013). By casting a wider net, schools can find more students who need remediation; therefore, schools must identify or have mechanisms to maximize remedial processes to benefit a growing number of struggling medical learners without overburdening the faculty (Bierer et al., 2015). Faculty may not identify struggling learners in time to intervene effectively or know which remedial techniques to use for learners with hard-to-access competencies, such as professionalism and communication, and those who require extensive guidance and mentoring (Bierer et al., 2015). Because of limited faculty time, institutions have created teams of experts to manage remediation (Bierer et al., 2015). Such professional teams can develop guidelines and best practices to provide more efficient and successful approaches to assist struggling learners (Bierer et al., 2015). One common practice is working with students to be good self-regulated learners, which correlates with higher academic performances (Gandomkar et al., 2016; Patel et al., 2015). Gray and Toms (2018) examined two holistic remediation programs based on a frequent assessment and rapid remediation paradigm (Ricketts & Blingh, 2011). When students undergo remediation, they are monitored by an academic review group. This group looks at all individual students' summative assessment performances

within the medical program. This group offers tiered and timely remediation packages to identify struggling students using specific, measurable, achievable, realistic, and timely objectives (Ricketts & Blingh, 2011). Even though these programs have been effective at the specific institutions in which they were implemented, students are still first identified as failures to receive these services.

Additionally, these programs are reactive in response to student failure and are not proactive measures designed to prevent failure. Many medical schools want to find models that can catch students who are struggling early. Remediation in medical education is defined as the act of facilitating a correction for trainees who begin the journey toward becoming a physician but have moved off course. This aspect is high stakes for learners as it currently can indicate the beginning of the end of their medical careers (Chung et al., 2019; Kalet & Chou, 2014). To catch students earlier, Ricketts and Blingh (2011) proposed a monitoring model. Universities could catch struggling learners early by monitoring undergraduate students during a gross anatomy course to detect those who could use extra support (Hortach & Mangrulkar, 2015). There is a benefit to identifying struggling students sooner rather than later and it is an area in which many medical schools are working to improve. By monitoring students' performance while in classes, schools can use formal notifications for academic deficiencies with structured remediation, recommend or mandate the use of learning support resources by students at risk, and provide help for students struggling with coursework or experiencing academic shortages.

Most remediation models are developed to retest students on an exam that they did not pass; this method provides a lack of insight into what types of extra support have been done or are needed (Cleland et al., 2013). Another intervention has been the consideration of screening the student for any undiagnosed learning difficulties, which could encompass memory,

processing speed, and perceptual and verbal reasoning (Gray & Toms, 2018). Knowing if students had any underlying past issues that may influence both motivation and academic performance is explored (Gray & Toms, 2018). As shown in the study, struggling undergraduate medical students often suffer a combination of many difficulties, not just content-related deficits (Gray & Toms, 2018). These students may benefit from a holistic, supportive approach in an environment that promotes a sustained academic performance recovery (Cleland et al., 2013). Level-2 remediation intervention involves the significant and sustained enhancement of students' medical knowledge performance. Finding holistic support models have a common theme of proactively supporting students and not stigmatizing.

Further work must be done to identify models that are proactive in supporting students who may be struggling. What is missing in remediation as an example of proactive support for struggling students is a more theoretical basis for remediation, such as how remediation practices do and should intersect with their parent medical education systems (Kalet et al., 2017). Each student experiences remediation differently. Generic remediation programs may fail to meet students' needs, as personal, social, and mental health issues are part of the big picture. Research shows 10–15% of medical students fail to meet satisfactory progress through medical school (Patel et al., 2015). Students want help with CS, social and emotional support, and improvement in the written exam (Hayes, 2012; Patel et al., 2015). Fear of termination if they talked to faculty prevented students from reaching out (Hayes, 2012; Patel et al., 2015). A three-step remediation process identifies students who fail at assessments: a remediation period, usually repeating part of the course, and retesting. This approach is now under scrutiny because there is evidence that this perpetuates the problem, and students continue to fail further along the path. Hayes' (2012) student profiles identified problems due to immaturity, lack of learning or organizational skills,

health or personal issues, and poor insight. Such profiles can make informed recommendations about appropriate interventions. There is a risk in pigeonholing and medicalizing the student experience around failure rather than growth (Hayes, 2012). Creating more proactive support programs for medical students can increase progression by getting students the resources they need sooner. Within Bierer et al.'s (2015) study, 92% of students met the expectation of remediation and graduated from medical school, demonstrating the team approach to remediation is effective. Early identification provides opportunities for multiple, tailored interventions to occur and is a critical attribute in an effective student support program (Bierer et al., 2015; Gray & Toms, 2018). Students can select appropriate remedial interventions that are supported by a well-trained faculty (Bierer et al., 2015). Educators should look at remediation as a growth opportunity rather than a punishment (Bierer et al., 2015).

A review of existing literature on current remediation practices does not identify a clear path toward effective remediation but instead calls for a model involving individualized instruction, a deliberate practice followed by feedback, reflection, and reassessment. Timely intervention, combined with individual counseling and early faculty engagement, has worked well. Similarly, Prunuske and Skildum (2014) discussed the concept of just-in-time remediation, which captures students early while applying competency-based remediation practices. The results of this just-in-time remediation should be supported, and other courses for students who undergo remediation have improved and continued to progress (Prunuske & Skildum, 2014). The key to student success is frequent feedback and rapid remediation. Recent studies such as Patel et al. (2015) and Hayes (2012) show academic environments, such as teaching methods and styles, examination rules, and the presence of remedial support, also affect study progress. Further development in evaluating a remediation intervention should be considered. The lack of detail

about these programs does not allow the situation and circumstances in which the intervention works to be determined. Individual analysis of student performance, during which feedback is given to aid the student in analyzing their educational progression with the school, is needed (Cleland et al., 2013). One program provided a model with “zones” that encouraged remediation to be integrated into the curriculum to catch struggling learners while measuring their successes (Ellaway et al., 2018). The zones offer an off ramp for students to potentially choose a different career path, instead of attempting to provide best practices to best support students wishing to remain in medical school (Ellaway et al., 2018). Again, holistic processes encourage proactive supports and are integrated into continuous learning for students.

Having clear processes for identifying struggling learners, how to support them individually, remediate students without punitive consequences, and ensure faculty understand that they must put in the time to help these learners should all be components of remediation (Chung et al., 2019). By starting to develop best practices in supporting students, students with disabilities will have the opportunity to have their diverse needs met.

### **Prevalence of Students with Disabilities in Medical Education**

Studying the performance of medical students with disabilities is unique and requires a better understanding of the prevalence and categories of disabilities (Meeks, 2016). Even though recent studies have investigated medical school disability rates, it remains unclear how many medical students have disabilities (Meeks et al., 2019). The prior estimates of medical students with disabilities are out-of-date (Meeks, 2016). The previous studies also speak primarily to physical disabilities and did not evaluate psychological, learning, and chronic health disabilities (Meeks, 2016). A survey by Meeks et al. in 2016 assessed the prevalence of all disabilities and the accommodations in eligible U.S. allopathic medical schools. Prior studies to 2016 indicated a

0.3 to 0.6% prevalence of medical students with disabilities (Kezar et al., 2019; Meeks, 2016), as compared to a more recent rate of 2.7%, an estimate that includes students with LDs and PDs (Kezar et al., 2019; Meeks, 2016; Meeks et al., 2019). Given the previous surveys, the prevalence numbers are likely underreported, especially because there is still a stigma surrounding PDs (Meeks, 2016). As a reminder, schools are under a federal mandate to document communication and decision-making regarding students with disabilities to support these data (Meeks, 2016). By having proper contacts, better documentation for students with disabilities will occur, and prevalence studies can be more accurate. Because of the reported prevalence in 2016, the AAMC put forth a call for action in 2018 to be more inclusive of learners and PWD.

Meeks et al. (2019) found that the medical students who disclosed disability status to their institutions increased from 2.7% to 4.6%, which is a 69% increase in students' self-disclosing disability status. Disclosing disabilities can aid in better well-being opportunities for medical students (Martin et al., 2020). Because of the high pressure and stigma, many students choose to not disclose their disability and have trouble seeking help when needed (Martin et al., 2020). There is a possibility that the increase in disability prevalence may result from more applicants with disabilities being admitted to medical school or that more students are disclosing their disability status upon entrance into school (Meeks et al., 2019). Although an increase in quantitative numbers of disability prevalence is observed, the addition of qualitative data about the culture these students experience or their retention in the medical school will allow for more supportive education programs (Meeks et al., 2019). Therefore, further research is needed to increase current documentation to show representation, which is a first step toward enhancing support for persons with disabilities within the medical school environment (Meeks et al., 2019).

More students may disclose their disability status if more current physicians disclose their disability status and offer mentoring on how to navigate a medical career with a disability (Martin et al., 2020). There is consistent stigma around disclosing all kind of disabilities such as mental health disorders (Wimsatt et al., 2015). Having a disability in medical school is only one of the barriers students face as they progress through their program.

### **Literature on Specific Disability Categories for Medical Students**

The current prevalence of students with disabilities in medical school has increased over the years and is a relatively new literature topic (Kezar et al., 2019; Meeks & Herzer, 2016; Meeks et al., 2019). In 2012, Eickmyer et al. reported a 0.3% to 0.6% prevalence of medical students with disabilities, including physical and sensory types of disabilities. In 2016, Meeks and Herzer found that 2.7% of medical students disclosed disabilities such as learning, psychological, physical, and sensory disabilities.

Even though recent studies have investigated medical school disability rates, it remains unclear how many medical students have disabilities in each disability category. Prior estimates of medical students with disabilities are out of date, and previous studies have included physical disabilities while excluding psychological, learning, and chronic health disabilities (Meeks & Herzer, 2016). A survey identified categories of disabilities of 2,000 medical school students who self-disclosed, including attention deficit hyperactivity disorder (ADHD), identified by the highest numbers of participants (33.7%), followed by LDs at 21.5% of respondents, and PDs at 20.0% of respondents, as well as mobility and sensory disabilities, which were a smaller representation (Meeks & Herzer, 2016). Some participants identified with more than one disability, so comorbidity must be considered. These percentages show the high number of students with invisible disabilities (which are underlying disabilities not seen by the eye, like

physical disabilities), such as ADHD, LDs, PDs, or chronic disabilities (Meeks et al., 2018). These numbers have since increased from 2016 to 2019 as more students have self-disclosed. This increase includes specific high-profile categories such as PDs, which increased from 20.4% to 32.3% of medical students identified with disabilities, and chronic health conditions of medical students with disabilities rose from 13.3% to 18.0% (Meeks et al., 2019). The prevalence of students with an LD, mobility, visual, or sensory disability either stayed the same or decreased (Meeks et al., 2019; Schwarz & Zetkovic, 2019). Although all disability categories can be found within the medical student population, recently collected data have focused on the two largest categories, LDs and ADHD; other categories are PDs and physical disabilities.

### ***ADHD***

ADHD is defined as a mental health behavioral disorder that affects attention (inability to focus), hyperactive traits, along with impulsivity (DAD, 2020). In the typical adult population, about 20% of individuals have reported ADHD in the United States (Robinson et al., 2004). A 1996 case study of three medical students who failed a standardized exam that was medical-school-specific and were later diagnosed with ADHD further supports the need for better support for these types of students (Tuttle et al., 2014). Medical school assessment is primarily multiple-choice exams, licensure, and board exams that students must continue to take. Using the 1996 study of medical students with ADHD, a school in Florida used 33 preclinical students who had already been diagnosed with ADHD. Roughly 63% of participants reported being diagnosed after they turned 18. In the ADHD students, quality of life negatively correlated to ADHD severity, meaning that the more severe their disability, the more significant the negative impact on their quality of life (O'Callaghan & Sharma, 2014). Although this is unsurprising, it does raise concerns, as the rigor and stress of medical education may hinder academically able students

with ADHD from becoming physicians. Students receiving accommodations and reporting significantly greater noticeable diagnosed symptoms are more likely to be identified and receive accommodations than those not receiving accommodations. This reporting indicates that students with the greatest severity of ADHD are receiving support, affording these college students access to educational accommodations. However, there are still barriers for students who are discovering they have a disability while just starting medical school (Petersen et al., 2021). Often these students come from diverse backgrounds and are unable to afford psychological evaluations needed to be fully diagnosed and receive suggestions on accommodations that could be beneficial to them (Petersen et al., 2021). Even if students receive a full evaluation and are referred for accommodations, they are usually given the standard accommodations that can aid in didactic settings, yet the transition into clinical practice for these students proves to be another barrier (Petersen et al., 2021). Accommodating a student with learning and attention issues in a clinical setting can be new for many schools and may be considered by medical educators to be unreasonable (Petersen et al., 2021).

### ***Chronic Health Conditions***

Chronic health conditions encompass diseases such as migraines, rheumatoid arthritis, diabetes, and many others (Ward et al., 2012). Chronic health conditions affect 49% of the U.S. population (Ward et al., 2012). With the prevalence number being so high for the general population, it is no surprise that medical students at times come into medical school with already diagnosed chronic health conditions. Yet throughout their lives, they tend to keep these conditions secret and do not disclose them until something bad happens (AAMC short article). At times they find themselves being a patient while attempting to train in being a provider. One student shared her experience in opening up about her disability when she felt safe to do so and

created a student support group for those with chronic illnesses (AAMC short article). Yet there is no indication of change in procedures and the article is written for an n of 1. Many articles are written on how to teach medical students about chronically ill patients, but never with the perspective of themselves also being chronically ill. It is interesting that there are many learning modules about how to train and work with patients with disabilities, yet these practices are not encouraged to be done for the providers themselves (Pols, 2009).

### ***Psychological Conditions***

Psychological conditions can encompass a range of disorders from depression, suicidal ideation, and anxiety, among a limited few (McKnight-Eily et al., 2021). Currently, the U.S. population has a reported 28–40% of adults over 18 with mental health disorders, exacerbated by the COVID-19 pandemic (McKnight-Eily et al., 2021). It is no secret that medical students may present with higher rates of psychological disorders. Disclosure among this population has increased over previous years according to the 2019 prevalence survey (Meeks et al., 2019). Working with these students can be troublesome for some medical education administrators. Studies have shown that medical students may present worsening mental health and well-being as they continue through medical school (Meeks & Murray, 2016). As in the AAMC student experience report, many students feel they must keep this aspect of their health to themselves until it has resulted in grade failures, or worse, in suicide (Meeks & Murray, 2016). Anxiety for this population is often contributed to examinations, such as the USMLE, due to the exam's high-stakes nature (Powell, 2004). Proper treatments and resources have proven to be beneficial to these students to help in the successful passing of these exams (Powell, 2004). One in three medical students globally have anxiety at a rate higher than the rest of the general population (Quek et al., 2019). Further research is needed to identify risk factors and resources for this

population (Quek et al., 2019). More specifically, resources should be given to students at the start of their education to proactively prepare them, rather than waiting until the need presents (Roseik et al., 2015).

### ***LDs***

LDs refer to the educational terminology for a set of disabilities that impact individuals' capacities to process information in several modalities. These disabilities are known medically by various terms such as dyslexia, dysgraphia, and dyscalculia. There is a range of percentages in studies that give prevalence numbers of adults with LDs ranging from 6% to 20% (Corley & Taymans, 2002). An early 2000 study indicated that over 50% of the students with LDs were not aware they had an LD when they entered college due to not being identified in K–12 because of also being academically gifted (Javaeed, 2018; Rosebraugh, 2000). A 1988 study conducted at a university revealed that two-thirds of LD students did not know they had an LD when they started their undergraduate education (Rosebraugh, 2000). They had demonstrated excellent high school achievements and, by all outward appearances, resembled everyone else attending college (Rosebraugh, 2000). Students with LDs may even graduate from college without having their disability diagnosed. The group with high abilities that have undiagnosed LDs is referred to as gifted-learning-disabled students because their ability is above that of an average student. Yet, they still have academic struggles compared to others with high ability levels (Rosebraugh, 2000). In the early 2000s, LDs affected roughly 15% of the general population and 3% of U.S. medical students (Rosebraugh, 2000).

When these students enter medical school, a pattern develops. The more challenges they face, the more unsuccessful their studying habits or behaviors become, and their academic results only continue to worsen (Rosebraugh, 2000). For example, some with undiagnosed disabilities

may find their previously adequate coping strategies overwhelmed when studying medicine, which could be due to increased reading, difficulty of content, and timelines to acquire this knowledge, leading them to seek a diagnosis (Shaw et al., 2017). The struggle can turn into a vicious cycle until they lose self-esteem and sometimes may even become clinically depressed (Anderson & Shaw, 2020; Child & Langford, 2011; Morris & Turnbull, 2006; Murphy, 2009, 2011; Romberg et al., 2016). There have even been instances of bullying of these students by peers and faculty (Anderson & Shaw, 2020). Overall, a lack of support systems in place is a perceived gap in supporting these students (Anderson & Shaw, 2020). Accommodations that were given, such as extra time on exams, were indicated as sufficient but after these were given, there was lack of faculty support on how to continue to support students with these accommodations (Anderson & Shaw, 2020). The lack of psychological supports was highly emphasized (Anderson & Shaw, 2020). More inclusive teaching environments could be useful for these students to avoid learning barriers, along with more research to be able to create these inclusive environments (MacDougall, 2009). Students with LDs are not the only population that experiences challenges in higher education or medical school.

A literature review about LDs in colleges by Zeng et al. (2018) indicated that LDs have increased in college education over the past decade. The study's findings suggest the student-centered approach is an essential characteristic of current academic interventions for students with LDs in college education (Zeng et al., 2018). If the number of students with LDs increases in college, then the number of those students who go into graduate education will also increase. Therefore, looking at successful practices for improving college interventions is essential for today's educators (Zeng et al., 2018).

### *Sensory Disabilities*

Sensory disabilities are represented by deaf and hard-of-hearing (DHoH) and hard-of-seeing individuals (among other aspects). Prevalence of the U.S. adult population with sensory disabilities is reported to be roughly 3.3% (Caban et al., 2005). Meeks et al. (2018) discussed how to provide better access for DHoH learners in emergency medicine (EM). The article argues that having more representation of DHoH physicians in emergency rooms can help decrease healthcare disparities (Meeks et al., 2018). An increased number of DHoH students have been entering medical education, but students continue to be pushed away from specific specialty careers (such as EM) over concerns regarding their ability to communicate effectively (Meeks et al., 2018). Given the commitment to diversity of academic medicine communities, the successful inclusion of DHoH students in EM can benefit medical education and practice (Meeks et al., 2018). By showing the successful inclusion of this population, we can continue to learn how to provide supports to increase the population of students with disabilities. DHoH individuals comprise 23% of the population (above 12 years of age), and over 500,000 patients use American sign language (Meeks et al., 2018). With the increase in technology, the inclusion of DHoH students is also increasing. DHoH students can follow procedural instructions and respond to codes and other environmental cues; even though these tasks require regular communications, the alternatives provided were shown to be effective (Meeks et al., 2018). Medical schools must understand the variations of disabilities a student can present with, and DHoH students are one example alongside those with sensory and other physical disabilities. If there is a willingness to accommodate students with all types of disabilities, these students can be represented more in the classroom, as well as in practicing clinics. McKee et al. (2016) indicated

that to better serve this population, schools should consider incorporating more functional standards that permit accommodating people with disabilities.

### ***Physical Disabilities***

Physical disabilities can encompass an array of limited abilities such as a lack of ability to use limbs, like able-bodied populations (utilizing a wheelchair, cane, having missing limbs, etc.; Neal-Boylan et al., 2016). Studies have indicated that 8.5% to 20% of the U.S. adult population have a physical disability (Long-Courtney et al., 2015). The rate of medical students and physicians with physical disabilities continues to be lower than the rest of the general population (Moutsiakakis, 2009). Technical standards can contribute to the reason why there is low representation of this population, either by students being limited in their physical movement or students not understanding the wording when applying (Eickmeyer et al., 2012; Schwarz & Zetkalic, 2019; Wainapel, 2015).

The myths that are expressed for healthcare professionals with physical disabilities are often untrue but create a barrier for these students to access services. Once again, the use of technical standards must have continual updates so they integrate with modern times and technology to prevent discrimination (Neal-Boylan et al., 2016). With increasing numbers of diverse learners coming into medical education, a more inclusive environment must be cultivated to support students with physical disabilities, PDs, and LDs (Prunuske & Skildum, 2014). By developing supportive environments, students may feel safe applying to medical school without discrimination and will activate the resources they need without barriers.

### **Barriers for Medical Students with Disabilities**

The barriers found for medical students with disabilities have predominantly two types: structural and those that stem from an institution's culture and climate. A structural barrier in

medical education would be things such as curricular design, curricular materials, and administrative and/or instructional practices. Cultural and climate barriers may include things such as the institution not embracing inclusive ideals and philosophies and a reluctance to make institutional changes that would be more supportive of a diverse student population. The specifics of how these barriers impact students has been identified specifically in past research (Meeks et al., 2021).

### ***Structural Barriers***

One primary structural barrier could consist of restrictive or outdated policies and procedures. An example might be not indicating to students how they can request accommodations for classes if they qualify (Meeks et al., 2021). The lack of policies on accessing services indicates that their disability should remain hidden and therefore encourages the stigma that these students feel as barriers and they will not disclose (Meeks et al., 2021). A second structural barrier is a poor understanding of clinical accommodations. Students may need scheduling considerations due to disability-related impairments, such as no night shifts or no longer than 24-hour shifts. Students often fear retaliation by attendings and biased grading if these accommodations are asked for. Finally, a third structural barrier can exist due to a lack of disability/wellness support services and a physical environment that limits accessibility (Kim, 2015; Meeks et al., 2018). Examples can be within a classroom that does not have ramps for students who need different modes to get in and out of classrooms, as well as within the hospital environment. If this is an issue for students, then this is also an issue for patients.

The MCAT is an entrance exam that all students applying to medical school must take before being reviewed and possibly accepted by admissions committees. While in medical school, students are required to take and pass the USMLE, which consists of three parts (Step 1,

Step 2 (CK), and Step 3 (CS)) that students must pass to match into residency. Delaying the ability to take one of these exams or possible failure can hinder students from matching into residency programs. Once students are matched into residency training programs, they must take the Step-3 exam and their specific specialty boards (i.e., internal medicine, pediatrics, OB/GYN, etc.). Accommodations are limited with these exams, and the application process for requesting accommodations on these exams is a long invasive process, which proves to be another barrier for these students.

Few investigations have examined the effectiveness of specific educational accommodations for medical students with disabilities (O'Callaghan & Sharma, 2014). Because there is limited research of accommodations for premed or undergraduate students, this lack of literature shows that further research is needed to examine the impact of academic accommodations for medical students with disabilities, investigating a possible relation between academic performance, symptom severity, and the granting of extended time on exams or providing limited-distraction testing environments. It is crucial to understand these testing accommodations because all medical students must take and pass medical boards.

For example, one standard accommodation is extra time on exams, yet not every student requires this accommodation based on their disability. Support programs have been developed because of the standardization of accommodations in higher education, which do not fully support all students. Yet, there is limited research published that speaks to the long-term outcomes of these college service programs. Currently, there is a standard approach to providing accommodations for college students. A typical accommodation such as extended time on exams has come under scrutiny in literature because time accommodations may not be needed for all types of disabilities. This scrutiny further supports the need for more documentation of adequate

accommodations for students with disabilities; even though there are more students in general higher education with disabilities than in specifically medical education, the caring for these students in both settings is still unfamiliar (Baverstock & Finlay, 2002).

### ***Cultural and Climate Barriers***

Cultural and climate barriers have very immediate, specific, and practical implications for students and residents needing access (Kim, 2015; Meeks et al., 2018). These barriers are overarching, institutional beliefs or philosophies that determine policies, procedures, and practices in the institution. Needed changes to support students cannot be made if the institutional culture is not supportive of including students with diverse needs and backgrounds. An example of a climate barrier could be the extended program time students may need to finish their medical program due to their disability and the structural barriers discussed previously. Institutions unwilling to examine how these barriers may be overcome are establishing a cultural or climate barrier.

An example of a prominent obstacle for medical students with disabilities is standardized exams throughout their medical program. The most common barriers faced in medical education by students with disabilities are: (a) required standardized exams, (b) applying and receiving accommodations for standardized exams, (c) accommodations for course work, and (d) finding resources for disabilities in higher education. Diminishing stigma around PWD is also imperative (Kim, 2015). As the current generation of students who have received accommodations through the Americans with Disabilities Act (ADA) throughout their undergraduate careers progresses towards graduate education, more adults with disabilities will likely enroll in medical schools. On average, medical students who had approved accommodation on the MCAT have lower rates of completing medical school in 4 years and lower rates of passing the USMLE (Searcy et al.,

2015). These findings of admissions versus graduation rates raise questions about the types of learning environments and support systems needed by students with documented disabilities (Searcy et al., 2015). The lower performance on the USMLE step examinations and the longer time needed to graduate from medical school for individuals who have received accommodations also suggest that medical schools do not fully support these students in the current curriculum and support programs. Universities must examine their learning environments and support systems for individuals with disabilities (Petersen et al., 2021).

More research is necessary to understand the interplay between disability and performance differences and improve the medical education process for students with disabilities (Petersen et al., 2021). Further research can add information about the accommodations provided on the USMLE step examinations and how they compare with MCAT accommodations (Searcy et al., 2015). Although the use of accommodations on standardized tests such as the MCAT exam is known and tracked, what is missing is the understanding and use of accommodations within the medical education program. This realization supports the need for better support models for students with disabilities in medical education (Kim, 2015). Without understanding the needs for testing or behavior accommodations, support models cannot be directed appropriately to meet students' needs (Kim, 2015). Students with disabilities who passed the USMLE step examinations did so at lower rates (11.9% difference from those who took the exam with regular time) and took longer (difference of 18.9% compared to those who graduated in the standard 4-year timeframe without delay) to complete medical school (Searcy et al., 2015) and the difference in graduation rates between students with protected disabilities is clearly different than those without disabilities (Teherani & Papadakis, 2013). These rates indicate that there are current barriers, and perhaps success rates could become like the rest of the student population

by looking further into whether students are actually being given proper accommodations (Meeks et al., 2021).

Reasons for differences during medical school and subsequent performances during and beyond residency training should be assessed due to disparities and costs to the medical school and student (Teherani & Papadakis, 2013). One can question whether these environments and support systems enable students to succeed in medical school. Once again, having a better understanding of students with disabilities and monitoring them will provide quality data (Jain, 2016; Kim, 2015; Petersen et al., 2021).

In the first year of medical school, self-referral and academic failure were the most common means by which the deans of the responding medical schools became aware of a disability that might require an accommodation; this was the only time a student's disability would be noticed or disclosed (Rosebraugh, 2000). As a result of these struggles, creating an assessment team was suggested to ensure students' consistent treatment with a disability and request accommodation. Along with an assessment team, schools should develop a pool of qualified personnel, such as learning specialists/teaching faculty/psychologists and administrators responsible for student progress, to serve as assessment team members, recognizing that the most significant number of accommodation requests are related to LDs, particularly for students with academic difficulties (Rosebraugh, 2000). Identifying requirements and functions essential for each stage of the medical school program, where technical standards are reviewed periodically, would be beneficial (Rosebraugh, 2000). Identifying students early on so that supports can be provided before a crisis may allow staff to better explain progression through the program and identify potential hurdles for students with disabilities.

Studies have shown faculty support and mentorship is necessary for student success (Morales & Mata, 2016). Faculty and administrators may not have the breadth of understanding of what their students with disabilities need to be successful in their medical education and future career. Therefore, students are unable to have proper access to resources, creating a sense of exclusion. Because of this, it is suggested to continue to educate administrators, staff, and faculty about disabilities so that the inclusivity of disabilities is common for all who work at medical schools (O'Callaghan & Sharma, 2014; Rosebraugh, 2000). This would include implementing a support model that uses evidence-based data to increase all learners'—including those with disabilities—academic and career performance trajectories to better identify which supports and accommodations are the most effective. Considering the Searcy et al. (2015) study, a few questions should be posed to better understand current practices: Who received extra time on the MCAT among those receiving the same accommodations in medical school? Did the students have the proper supports to enhance their learning as students while testing with accommodations? Did the students have accommodations on the USMLE Step 1 exam? If they did not receive those accommodations, why not? By answering some of these questions, medical school educators and administrators can start gaining a much-needed understanding of medical education barriers for students with disabilities to develop evidence-based policies, procedures, and resources (Searcy et al., 2015).

The inclusion and use of an evidence-based model can support students sooner rather than later and aid in better disclosing disabilities. Identifying the various disabilities can increase the collective understanding of persons with disabilities (Meeks et al., 2018). Although no single support model is being used in medical schools to support students, a model has been developed and is presently being used for K–12 students.

In the K–12 system, students with disabilities are protected under the Individuals with Disabilities Act (IDEA; 2004) and usually receive services for their education. Yet these students who might have received individualized accommodation in secondary education may not receive these accommodations when entering college (Viezel et al., 2020). Students are not receiving accommodations in college because colleges are not obligated to individualize education to prevent student failure. The ADA requires colleges to provide accommodations to students with disabilities regardless of the level of impairment and accommodations used to provide students with equal access to education (Viezel et al., 2020). In undergraduate college settings, approximately 25% of students receiving services through disability resource centers are identified with ADHD (DuPaul et al., 2009; Wolf, 2001). Evidence suggests that a subset of students with disabilities in college face significant difficulties pursuing higher education even with protective factors (DuPaul et al., 2009). Different types of disabilities require different ways of adapting to learning styles and study strategies. Therefore, a traditional grouping of various disabilities for academic intervention may not be as valuable as developing specific plans for each group alone. Therefore, these accommodations may not meet the actual needs of every student.

A literature review about LDs in colleges by Zeng et al. (2018) indicates that LDs have increased in college education over the past decade. The study's findings suggest that the student-centered approach is an essential characteristic of current academic interventions for students with LDs in college education (Zeng et al., 2018). If the number of students with LDs has increased in undergraduate education, then the number of those students who go into graduate education will also increase. Therefore, looking at successful practices for improving college interventions is essential for today's educators (Zeng et al., 2018).

## **Universal Design for Learning**

Universal Design for Learning (UDL) provides products, buildings, or environments that are used by the widest possible range of users (Rosebraugh, 2000). The concept is generally regarded to have been developed by colleagues at the Center for Applied Special Technology following the 1997 reauthorization of IDEA (Edyburn, 2005). The initial principles were formed drawing on UD principles in architectural designs (e.g., curb cuts allow access to sidewalks for people with wheelchairs, but are also often helpful to others, like those pushing strollers or on bicycles). In the 2004 reauthorization of IDEA, UD was given a federal definition:

The term “universal design” means a concept or philosophy for designing and delivering products and services that are usable by people with the widest possible range of functional capabilities, which include products and services that are directly usable (without requiring assistive technologies) and products and services that are made usable with assistive technologies. (U.S.C. § p. 32)

The learning aspect comes from being inclusive in the instructional environment by removing barriers from teaching methods and curriculum materials. By providing multiple means of representation to measure learner understanding, one is providing language and symbols that meet the different abilities for learners (Balta et al., 2021; Petersen, 2020). UDL also provides multiple means of expression and engagement (Balta et al., 2021; Petersen, 2020). A variety of active teaching techniques along with a range of assessments all encompass the UDL concept (Petersen, 2020). Work on UDL is well-represented, and commonly expressed in the literature is that UDL steers away from the “one size fits all” approach (Balta et al., 2021). The concept of UD in education provides intentional access for a variety of learners, not accommodations (Petersen, 2020). Accommodations still serve the individual needs of those who

qualify for them (Petersen, 2020). Minimizing the number of accommodations and adjustments needed for diverse learners by creating a learning environment that is inclusive and creative for all learners from the beginning is the ultimate goal in UDL (Meeks et al., 2016; Scott et al., 2003). How UDL can be used in health sciences curricula must still be further researched (Petersen, 2020).

### **UDL in Higher Education**

The UD term is currently being used frequently in higher education. In student services, as well as in classroom instruction, the goal is to create a proactive approach to education to develop more inclusive design to welcome diverse learners (Scott et al., 2003). College enrollment of full-time freshmen with disabilities has increased over the past few years (Henderson, 1999). Many projects that integrate new orientations for incoming freshmen incorporate the UD theory (Goff, 2008). Griful-Freixnet and colleagues (2017) found that the principles of UDL as designed for K–12 education aligned well with the needs expressed by undergraduates with disabilities, specifically the principle of multiple means of engagement. The scholars indicated that eliminating barriers for some students may create additional problems in learning success for others; for example, when notes or lectures are provided to all in advance, class attendance can drop. Previous studies had already indicated that the application of UDL in undergraduate classes had a positive impact on academic performance (Burgstahler & Cory, 2008; Scott et al., 2003; Silver et al., 1998) and UDL in higher education supports better access to instruction and services and increased student participation, resulting in better academic progress (King-Sears, 2009; Kortering et al., 2008; Rose & Meyer, 2002). A team approach should be incorporated from academic support faculty because those who are trained to work with assistive technology can play an important role in making changes to instructional materials

(Petersen, 2020). Some examples of certain successful components of UDL implementation are informative and clear course syllabi, a variety of teaching styles and modalities to relay course material, offering teaching practices for students to engage and respond by giving feedback, and differing and clear guidelines for course assignments (Gradel & Edson, 2009). Perhaps the most current barrier to wider understanding and implementation of UDL in higher education is that UDL is often presented and discussed as a framework supported by principles, but not as a specific intervention to be applied to curriculum and instruction (Fornauf & Erickson, 2020).

### **UDL in Medical Education**

Some institutions in medical education have utilized the concepts of UDL within their curricular structure. There is growth in the literature examining the use of UDL in premedicine coursework, other medical professional programs, as well as in medical school (Balta et al., 2021; Dempsey et al., 2021; Luke, 2021; Maduakolam et al., 2020; Odukoya et al., 2021). For example, in a medical school setting, UDL can be utilized to assist students who have color vision deficiency to provide accessibility resources. Examples are adjusting the color of laser pointers, providing high-quality grayscale images alongside microscope images, and coaching around strategies for recognizing clinical indicators (Jain et al., 2019). In the diversity aspect of medical education, *culturally responsive UD for learning* is an approach used for learner diversity in educational theory development and curriculum design (Maduakolam et al., 2020; Odukoya et al., 2021). Specific courses, such as anatomy, utilize UD concepts in creating their curriculum (Balta et al., 2021). Luke (2021) provided specific suggestions for how UDL can be incorporated into medical school education, focusing on access to course materials and instructional modalities.

The concept is considered more often in medical education now because of new technology and resources that students utilize beyond traditional teaching materials (such as printed textbooks). UDL allowed for anatomy material to be presented via multiple means, which enables students to demonstrate their learning by multiple avenues. One of the biggest advantages for this method was that it allowed for diversity within curriculum to accommodate for diversity in student learning rather than the expectation that students would change their learning approaches based on constraints of the curriculum (Balta et al., 2021).

There may be continued growth in the literature regarding the use of UDL in medical education due to instructional changes required to accommodate the COVID-19 pandemic. Longhurst (2021) provided a first-hand account of teaching anatomy via online modality to a student who was blind. Smith and Pawlina (2020) discussed adaptations that were made primarily to anatomy classes, but also other laboratory or clinical medical education courses in the wake of the pandemic, and how continued use of these types of instructional designs can make medical education more inclusive in the future.

## **MTSS**

MTSS as a model was created through a UD lens, meaning UD supports all students regardless of need. The goal in K–12 education is to decrease the overrepresentation of students in special education. By minimizing the number of individual accommodations and alterations needed for diverse learners, UD shows flexibility to include all learners from the very beginning (Scott et al., 2003).

In K–12 education, a system that meets each student's diverse learning and behavior abilities is called the MTSS. MTSS aids in the prevention of academic and behavioral difficulties through high-quality, research-based core instruction provided to all students (McIntosh &

Goodman, 2016). Conceptually, the framework is educators providing good core instruction, identifying students at-risk academically and behaviorally through frequent screening, providing evidence-based interventions and increased support to respond to students' needs, and monitoring students using frequent progress monitoring (Bennett, 2018; Fuchs & Fuchs, 2017; Walker & Shinn, 2010). MTSS provides increasingly intensive and personalized tiers of intervention that incorporate evidence-based interventions when students do not respond successfully (Chard & Linan-Thompson, 2008). Although there is some variation in models, most MTSS models use three tiers (Tiers 1–3), each with their own instruction and student-support interventions. Most of the tiers are taught by general education teachers, with general education holding most of the responsibility for core instruction at Tier 1 by delivering UD instruction to meet the needs of all students (Fuchs et al., 2012). MTSS supports academic achievement, improves behavior, and overall decreases special education placements (Bennett, 2018; Bollman et al., 2007; Peterson et al., 2007; Shapiro, 2016; VanDerHeyden et al., 2007). Promising findings have risen from MTSS implementation.

Implementation of this program takes time and effort; however, as cited in McIntosh & Goodman's (2016) implementation manual, the late Glenn Lathan (1988) described education as the continual change in ideas and practices in the search for continuous improvement. It is essential to have strategic approaches to integrating academic and behavioral support systems, which carefully consider where integration works best to improve student outcomes (McIntosh & Goodman, 2016). This idea has become very popular, and more school districts have been moving forward with the implementation of MTSS, and MTSS has gained prominence in conversations about education reform (McIntosh & Goodman, 2016).

First seen in education in 1994 by Simeonsson, the original MTSS was a public health model and used in medical textbooks that used a three-tiered model in identifying and treating specific health symptoms (Simeonsson, 1994). Tier 1 services are described in public health as universal and are for all individuals, regardless of their health (i.e., need; Simeonsson, 1994). The goal of Tier 1 support is to prevent a particular condition from occurring. The condition, for example, could be heart disease (Simeonsson, 1994). Tier 2 services (often described as selected in the clinical literature) are intended for those at increased risk of contracting a specific condition, possibly based on demographics or location (Simeonsson, 1994). The goal of Tier 2 support is to reduce the chances of the individual contracting the condition. Tier 3 is used for individuals who have already acquired the infection or illness (Simeonsson, 1994). Tier 3 support aims to lessen the effect (or symptoms) of the disease or cure it. This public health model was adapted and implemented in the K–12 education system (Simeonsson, 1994). This tiered model was replicated in the K–12 system to target academics and behavior in MTSS.

For MTSS to be implemented and for it to support all students, curriculum delivery is one area that requires extra attention. Observing the curriculum can help ensure it is universal for all students and adjusted to maintain students' success. An effective curriculum that is delivered efficiently is intended to prevent challenges in learning how to read (and behave; Fuchs et al., 2012). In the domain of behavior, we teach students expectations and provide them with the skills they need to be successful socially and emotionally and prevent unwanted behavior or anxiety (Fuchs et al., 2012). Environmental manipulation such as symbol signs is used to remind students about prosocial behavior or routines to manage traffic, much like signs of washing hands or the sight of hand sanitizer dispensers at convenient locations help with universal hygiene (Fuchs et al., 2012). This is beneficial to all students, even if the intended signs are

perhaps meant for students who cannot read. However, universal interventions can do more than prevent problems; we can also view them as opportunities to optimize learning or cultivate students' strengths (Seligman, 2002). For example, there may be academic instruction to expand students' interest areas and develop their curiosity for intellectual learning or teach responsibility to discourage problem behavior and teach practical skills to intervene with others to promote social justice (Fuchs et al., 2012). In creating a universal curriculum approach, schools must make a safe place for students to get help when they are at risk.

Students are identified as at risk due to demographics or progress-monitoring measures (Fuchs et al., 2012). In the medical field, growth charts or blood pressure tests provide quantitative estimates of risk by identifying trajectories toward cutoffs for significant challenges (e.g., failure to thrive, hypertension; Simeonsson, 1994). In K–12 schools, there are similar measures used to assess trajectory toward healthy academic growth (e.g., curriculum-based standards, unit tests) or adverse social outcomes (e.g., office discipline referrals, attendance, behavioral screeners, and high school early warning systems; McIntosh & Goodman, 2016). These tests may tell us that more instruction, more opportunities to experience success, or developing a caring relationship with another adult in the building could improve the quality of universal support (McIntosh & Goodman, 2016). These educational components are then broken down into tiers, similar to the original public health plan.

### ***Tier 1***

Tier 1 intervention provides universal support for all learners and promotes classroom interventions, such as active engagement that contains collaborative, content-related discussion (Hunter et al., 2015). Tier 1 of the MTSS structure provides early intervention and identification for appropriately differentiated instruction (Gamm et al., 2012). By using empirical practices,

teachers are assumed to be more likely to implement Response to Intervention (RTI) and Positive Behavioral Intervention Support (PBIS) activities for their students (Detrich et al., 2012). The goal of Tier 1 is to structure classrooms and schools to minimize academic and behavior problems through proactive instructional methods and classroom management (Hunter et al., 2015). If students are not demonstrating success at Tier 1, having a transparent, stable Tier 2 intervention process is essential.

### ***Tier 2***

Tier 2 interventions are designed to provide efficient, cost-effective support for students nonresponsive to Tier 1, which serves all students universally at once (Anderson & Borgmeier, 2010). System-research-based interventions that fit the school context delivered with fidelity are essential, but they are not the only aspect of the Tier 2 system (Rodriguez et al., 2016). The goal-efficient provisions of resources to interventions with a high contextual fit and social validity are likely to positively impact significant numbers of students at risk of recurring behavior problems (Hoyle et al., 2011). Early identification requires that teams have strategies for student identification, including those who would benefit from Tier 2 behavioral supports by building and strengthening positive habits from the start of the year (Rodriguez et al., 2016). Tier 2 interventions should include the following types of support: direct teaching, prompts, opportunities for practice, frequent opportunities for feedback, fading procedures, and regular parent communication (Anderson & Borgmeier, 2010). If Tier 1 or Tier 2 interventions still do not result in student success, moving them into Tier 3 for further support will give them a better chance of success.

### *Tier 3*

Finally, the highest Tier, Tier 3, is an indicator for students who need high levels of support; this Tier is therefore reserved for students with the most complex concerns, necessitating individualized student assessment and intervention (Barrett, 2018). Tier 3 interventions should take place only when students are placed into special education. Teachers involved in Tier 3 education need the most training to provide proper education for students at that level (Barrett, 2018). Not all the students need to have Tier 3 interventions if given appropriate interventions during the lower tiers (Barrett, 2018). If Tier 1 or Tier 2 intervention practice is working, it is possible to decrease students' representation in Tier 3; therefore, more professional development must happen so that Tier 1 support is vital (Barrett, 2018).

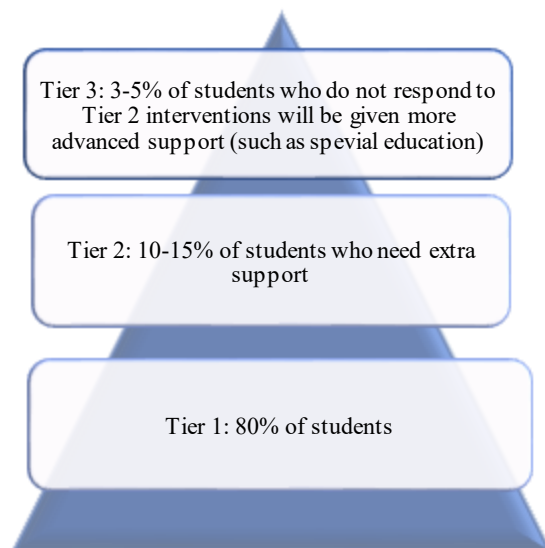
A student is identified for Tier 3 support after determining that they are not responding to Tier 2 interventions. These measures found in Tier 2 can include additional support such as group study with classmates and the teacher, which have also been provided in the same way for all students (Barrett, 2018). Documenting that the additional measures have not been enough to prevent significant continual challenges indicates that students need more intensive interventions (Barrett, 2018). When the student is placed into the intensive support of Tier 3, individualized education plans are formally developed to support the student to succeed. Many of the conditions attempted to be identified early in school (i.e., LDs, behavior disorders) are socially constructed in that there is no exact test for the disorder, but rather a point of functioning at which these disabilities are declared to exist (Tilly et al., 1998). In this way, Tier 3 support helps those with disabilities (i.e., brings students' functioning within typical limits) or as a plan to mitigate the effects of the disability (Barrett, 2016). Because the educational plan is already documented, or if new disabilities were present, there are approaches presented in many support plans, with the

best goals determined through close partnerships with families (Barrett, 2018). The two intervention systems that are integrated into the MTSS model are academic and behavioral.

Figure 1 presents the conceptual framework of MTSS.

### Figure 1

#### *Conceptual Framework of MTSS*



### RTI

Research on MTSS has demonstrated positive outcomes for students (Fuchs et al., 2012). The effectiveness of RTI can be seen with the results of improved student outcomes when implemented by typical school personnel (McIntosh & Goodman, 2016). RTI, an academic intervention, has provided evidence that implementation, especially in early literacy, can improve struggling learners' overall academic achievement, enhance their neurological functioning, and decrease eligibility for special education services (Gunn et al., 2000).

In describing RTI's history, one can say the concept was founded in the 2004 IDEA component of the initiative, but others might indicate otherwise. One such example is that Fuchs

et al. (2012) focused on alternatives to RTI to identify specific LDs through the ability-achievement discrepancy model. RTI was developed as an alternative to the discrepancy model, which had been in place since the earliest days of identifying LDs. Several researchers suggested that the approach of identifying LDs by comparing cognitive abilities and academic achievement has several drawbacks, including mythological, theoretical, and practical challenges (Fuchs et al., 2012). Probably the most notable disadvantages for educators were the lack of treatment validity (the extent to which the assessments indicated the specific interventions to use) and having to wait until a significant discrepancy appeared before students became eligible (often Grade 3; Fuchs et al., 2012). This commonly termed "wait-to-fail" approach was viewed as harmful because students could not receive the needed services that could potentially prevent their challenges (McIntosh et al., 2008). More so, the developmental window when remediation is most effective would rapidly be closing, leaving more significant gaps and persistent experiences of failure (either academic or behavioral) that could cause additional challenges (McIntosh et al., 2008). Leading scholars proposed that special education eligibility decisions could be made through monitoring the response to further intervention (Fuchs & Fuchs, 1998). Having a clear understanding of the three tiers is an essential aspect of the model and its implementation. Hunter et al. (2015) described the diversity of academic and behavioral needs in student populations that did not always warrant education placement.

On the other hand, an inadequate RTI would signal the need for more intensive intervention (perhaps specially designed for that individual) and perhaps the presence of a disability, based on the lack of growth in response to an intervention that is effective for similar students (Fuchs & Fuchs, 1998). Adequate RTI would indicate that a disability was not present,

and that the intervention provided adequately supported the student's learning. Combining RTI with behavior support can be a more successful combination in helping students succeed.

## **PBIS**

PBIS usually happens school-wide to promote all students' prosocial behavior and academic competence (Horner et al., 2010). PBIS has effectively created more positive school environments, yet 20% of students still need more intensive support (Horner et al., 2010). Many researchers have studied PBIS within the K–12 setting; the research includes multiple randomized controlled trials and narrative reporting to show reduced disruptive behavior and bullying and increased efficacy, social competence, and emotional regulation (Bradshaw et al., 2012). The components of RTI and PBIS can work together to create a better continuum for students as they go throughout the school. The principles of RTI and PBIS integrate a long-lasting continuum of supports that includes system-wide resources for all schools, strategies, structures, and evidence-based practices for addressing barriers to student learning and behavior (McIntosh et al., 2008). McIntosh (2008) described the similarities of RTI and PBIS when applied to the academic or behavior systems for prevention and optimization.

RTI and PBIS share quality instruction and system changes (be they academic or behavioral). The quality provided can drive the selection and implementation of interventions and the allocation of the effort. One main strength of the system is that the prevention focuses on *all* students, regardless of risk, and offers a continuum of support for students (McIntosh et al., 2008). The combined goal in implementing the academic and behavior systems is to enhance students' valued outcomes both in school and beyond, including success in college and professional school or just life in general. Educators aim to encourage students' success by providing them with the skills needed to access reinforcement for their actions, be it the ability to

read content in their interest area, deal with setbacks, or establish and maintain friendships (McIntosh et al., 2008). Each system's implementation has an instructional focus, and instruction is based on practical instruction principles, emphasizing differentiated instruction to provide that continuum of support (McIntosh et al., 2008). Finally, just as the instructional delivery is based on effective practices, both systems share a commitment to evidence-based practices—that is, those practices that have been shown to work across a range of classrooms for more students (McIntosh et al., 2008). The two systems are fundamentally data-driven.

Data can be described as the fidelity of implementation, student screening or benchmarking data, and progress-monitoring data, informing both instruction and the performance of the systems themselves (McIntosh et al., 2008). Both methods are fundamentally team-driven (McIntosh et al., 2008). Implementation is undertaken and monitored by teams that use the data mentioned above and the formal action-planning procedures to enhance the implementation's quality and effects over time (McIntosh, et al. 2008). Team-based approaches allow for collaboration across schools and practical implementation includes representatives from each group to maximize the extent to which all school educators are actively involved in establishing, planning, and sustaining these initiatives (McIntosh et al., 2008).

### **Differences Between RTI and PBIS**

There are differences between RTI and PBIS that must be highlighted. Tier 1 RTI refers to the core curriculum, whereas Tier 1 in PBIS refers to universal or school-wide instruction (McIntosh, 2018). PBIS might be implemented due to the overall school climate or disruptive behavior (McIntosh, 2018). Integrating academic and behavior support efforts may lead to more efficient use of resources and protection against multiple competing initiatives, enhancing both approaches' sustainability (McIntosh et al., 2009). There is a history in RTI and PBIS, so it is

essential to understand the evolution of both. When discussing integration into MTSS and the extensive spread and effectiveness of these two approaches (RTI and PBIS), there has been considerable informal discussion on how these approaches could be integrated into a coherent, unified system (McIntosh & Goodman, 2016). The integration of several multiple-tiered systems into one coherent, strategically combined system addresses multiple domains or content areas in education, including learning and social-emotional competence (McIntosh & Goodman, 2016).

### **MTSS Applied to Medical Education**

Utilizing the same terminology as K–12 (MTSS, tiers, UD, etc.), three-tiered levels can be incorporated into medical school. One benefit that medical admissions have, compared to K–12, is that the medical students are chosen. K–12 does not typically have control of where students go, nor which students enroll in their programs, which is a significant difference in medical education. UD can be incorporated within the first tier of support such as learning intakes done with all students prior to starting their first day of school, group tutoring sessions, the option provided for all students to have one-on-one tutoring, and any other supports that could be present among the intakes. When students start to struggle on written exams, Tier 2 interventions can be implemented (this can be determined by percent scores on single exams or quizzes). Behavioral interventions can be determined by frequent tardiness or lack of submitting assignments (such as in K–12). Tier 3 interventions can be done when students must undergo remediation due to failure of overall components of education. The process can be driven through the medical school's unit of academic support with collaboration of medical education, students' affairs, counseling, and disability services. The RTI process can be integrated by monitoring students' academics to determine if they need to move up and down the tiers.

Given the literature on the lack of inclusion of students with disabilities and the need for better-structured support models, the MTSS model could satisfy that need. In an *Academic Medicine* article from 2017 titled, “The Four-Tier Continuum of Academic and Behavioral Support (4-T CABS) Model: An Integrated Model for Medical Student Success,” authors Stegers-Jager et al. from the Netherlands developed a model similar to the MTSS model and implemented it in their medical school curriculum. They also indicated that many schools have intervention support, but do not have a structured model that exists like the MTSS model (Stegers-Jager et al., 2017). They utilized four tiers, with Tier 0 being an off-ramp for students who should probably not continue their medical education, instead providing them with other career options beyond medical school (Stegers-Jager et al., 2017). Tier 1 provided universal interventions for all students in a preventative and proactive fashion; Tier 2 had secondary interventions for at-risk students, utilizing small-group interventions; and Tier 3 had tertiary interventions for individual at-risk students (Stegers-Jager et al., 2017). The 4T-CAPS model showed progress with students who had previously failed; it recommended analyzing performance during the first year of medical school (Stegers-Jager et al., 2017). These scholars recommended frequent progress monitoring throughout medical school courses due to changing risk factors (Stegers-Jager et al., 2017). The successful implementation of MTSS relies on a continuum of systemic, coordinated, evidence-based practices for individual students and continued progress monitoring (Harn et al., 2011). The 4T-CAPS model was highlighted as an existing model relative to five other models that help address professional performance deficits (Mak-van der Vossen et al., 2019). Therefore, there is interest in continuing to implement MTSS models for early intervention at U.S. medical schools. Many medical schools have already implemented these discrete interventions, but not the model as a whole. Implementing an MTSS

support model will offer the required systemic structured framework (Stegers-Jager et al., 2017). The primary goal is to intervene early, which requires the timely identification of at-risk students.

## **Conclusion**

Students struggle throughout medical school for many reasons. As indicated above, these reasons could be attributed to transition, disability, socioeconomic factors, or poor curriculum outcomes. The common thread in the literature reviewed above is the goal to provide a sustainable model for students to receive support early before a failure occurs. Many models for student academic or behavioral interventions in medical education are done after the student has failed. Current models of remediation have been questioned regarding effectiveness and whether outcomes are long-lasting (Cleland et al., 2013). Medical schools are looking at supporting students holistically (meaning not just retesting content but also looking at behaviors, disabilities, and other aspects) before a failure can result in the recognition of a need for support or allowing students to pursue other avenues if desired (Cleland et al., 2013). Creating a more inclusive environment for students with disabilities by having a proper reporting mechanism from the beginning of education can help students from taking leave of absences or not graduating (Cleland et al., 2013). Models in the K–12 system like MTSS can help integrate the UD concept of knowledge to support all students while also being inclusive to learners with disabilities. Due to prevalence and disclosure rates increasing, being proactive in support means medical learners can better develop retention and outcomes for students to represent the healthcare field.

In reality, medical practice embraces such concepts as team-based care and information management skills (Kezar et al., 2019). Therefore, as part of incorporating UD practices such as an MTSS program, those in charge of medical education must focus more on teamwork abilities to be functionally valuable as part of a team (Kezar et al., 2019). Educators are becoming more

interested in students' problem-solving skills than in their factual memory or procedural skills (Kezar et al., 2019). The rise of competency-based medical education has helped drive these changes by broadening medical knowledge aims to integrate teaching within the profession by learning, and improvement as part of one's practice, then by ultimately shifting focus from assessment to measuring performance, rather than only knowledge (Kezar et al., 2019). With this approach, medical schools can assess students with disabilities' understanding and implement reasonable accommodations that will allow students to utilize alternative assessments to demonstrate their mastery of skills (Kezar et al., 2019).

The need for more research on measures to support medical students with disabilities will better inform educators on how to help them. The proposed robust research agenda would include investigating how to further understand the performance trajectory of learners with disabilities in a way that support models can monitor (Meeks et al., 2018). Another research area would be identifying the most effective supports and accommodations for learners with various disabilities (Meeks et al., 2018). Investigating these research areas will allow a collective understanding of the experiences of persons with disabilities in residency and subsequent employment. It will also provide a way to examine the impact of PWD on patient care (Meeks et al., 2018). Documenting profiles, disclosing disabilities, types of disabilities, interventions/accommodations given, overall academic performance, and student narratives can paint a more robust picture of supporting these students and increasing their representation in healthcare. By including individuals with disabilities as essential to medicine, better support can be had for patients with disabilities (Meeks et al., 2019). Medical students with identified disabilities can succeed in medical school on time, just like their peers. Implementing a UD approach in an MTSS model can break these students' barriers and aid in them successfully and

safely completing their medical education. The Netherlands has implemented a 4-CAPS model utilizing the MTSS UD concept, which has shown to be successful, and U.S. medical schools can quickly adapt.

The research problem for this study was to examine how a K–12 MTSS-style model can positively assist students with disabilities in medical school. The purpose of looking at this problem was to implement a new student support model found in the K–12 system, called MTSS, to investigate ways to assist students in medical school with disabilities and better support other students who struggle. The following research questions helped explore the best way to assist students with disabilities:

RQ1: What are students' perceptions of the supports available from the MTSS system as they progress through the program?

RQ2: How do students' perceptions of MTSS support compare among students receiving differing levels of support (Tier 1, Tier 2, or Tier 3)?

RQ3: What are students' perspectives on the MTSS model's effectiveness to promote them as medical students?

## Chapter Three

### **Purpose of the Study**

The purpose of this dissertation was to understand the perceptions of 10 medical students with disabilities regarding their experiences in a new academic support system. Currently, there are no other MTSS models in medical education available for review or to compare results. This pilot study examined one medical school's implementation of an MTSS model through the lens of 10 students who agreed to describe their experiences. Chapter 3 describes the research method and design, participants, model implementation, and how data were collected, managed, and stored.

### **Research Questions**

Through the implementation of a qualitative exploratory case study design, the following research questions guided this case study:

RQ1: What are students' perceptions of the supports available from the MTSS system as they progress through the program?

RQ2: How do students' perceptions of MTSS support compare among students receiving differing levels of support (Tier 1, Tier 2, or Tier 3)?

RQ3: What are students' perspectives on the MTSS model's effectiveness to promote them as medical students?

### **Rationale for Case Study Design**

Because of the study's novel nature and the participants' unique experiences, an exploratory qualitative case study design was used. The exploratory qualitative case study design enhances the description and analysis of a single case or multiple cases using qualitative data. According to Plano Clark and Ivankova (2016), qualitative method case studies allow

researchers to develop an understanding of an issue or experience utilizing the participants' narratives. This study approach allowed for me to gain an in-depth description of the challenges and successes of medical students who needed extra "tiered" interventions through the pilot MTSS model. This support model gained specific in-depth insight experiences of students who identified as having disabilities. By using this design, I was able to record perspectives of medical students upon their completion of their 4-year medical education.

### ***Case Study Definition***

The purpose of utilizing case studies is to provide an intensive, holistic description and analysis of a single, bounded unit situated in a specific background to provide insight into real-life situations (Merriam, 2009; Pickard, 2013). To consider utilizing a case study for research purposes, one must understand a case study's definition. Case studies are used as a research method to analyze a new program implementation or small sample size (Ponelis, 2015); this study, specifically, looked at a newly implemented MTSS program with a small sample size of 10 medical students. As a method, case study design held itself nicely for this study. For example, given that the support model implementation was a new program study with the main data collection being the narratives of specific students, case study again was the best design for the study. It is also essential to understand the differences in terminology so as not to be confused about what is being discussed: case study research (the mode of inquiry), specifically case studies (the method of investigation, or research method, used in doing case study research), point to the standard unit of inquiry in a case study (Yin, 2018). Therefore, the method used to investigate the new implementation of support models in medical education was a case study.

When contemplating whether a research project should be a case study, the main research question might ask "how" or "why" there is little or no control over behavioral events, and the

study focus is contemporary (as opposed to entirely historical; Yin, 2018). This concept once again held itself nicely for my study. By exploring specific issues, I became aware of the lack of literature on proactive support models in medical education, specifically, those models that aid in better progression for students with disabilities. In my research questions, I asked, “How do students’ perceptions compare among tiers?” Of my three research questions, all three asked for students to describe their perceptions of support programming. This dissertation focuses on the desire to understand complex social phenomena in which the need for case studies arises. Case study design describes a narrative graphically, meaning the reader can visually picture the narrative of the main themes being studied in response to the research questions; for example, in this study, the narratives are the participants’ (medical students’) perceptions (Miles et al., 2020).

In recent years, a case study has increased as a design strategy in empirical research on issues of medical education (Anderson, 2007; Cherian, 2007; Cornu & Ewing, 2008; Graham, 2004; Smith, 2007). According to Yin (2003, 2018), the advantage of utilizing case studies in empirical research is being able to orient to contemporary issues and its naturalistic approach. Because my study utilized a variety of planning, investigating, and reporting a wide range of tools, this held itself well for case study design (Yin, 2003, 2018). The case study also allows for modifications to be made based on what happened during the study, which is useful if the study goes into a different direction than originally planned (Yin, 2003, 2018). Due to the ability to have these modifications, the study’s rigor is not compromised because rigor is a main component of case study design. The case study strived to achieve rigor through a process of principled planning, investigating, and reporting (Yin, 2003, 2018). This was an important aspect of my study.

A critical component of defining a "case" is to set boundaries to the case (Yin, 2018). Case boundaries are defined as a distinction between the conditions that fall within as opposed to outside the case in a case study, such as the period, social groups, organizations, geographic locations, or other relevant features (Yin, 2018). For my study, four possible case designs were identified: Tier 1 student perspectives with disabilities, Tier 2 student perspectives with disabilities, Tier 3 student perspectives with disabilities, and lastly, Tier 2 or 3 student perspectives without disabilities. Having these unique perspectives allowed me to compare within and among cases. Those are the conditions in which each case was developed. Having these conditions, by definition, allows for internal validity, external validity, and reliability (Yin, 2018). There are two types of case study designs a researcher can consider when determining their case: single case study design or multiple case study design (Yin, 2018). There are specific components one should consider while building their case study research design: the questions, propositions, actual cases, logic linking the data to the propositions, and criteria for interpreting the findings (Yin, 2018).

### ***Exploratory Case Studies***

My study was an exploratory case study. Exploratory case studies are one of the most popular forms of case studies used (Yin, 2018). The definition of exploratory case studies is that it is a method that condenses the case study and purpose to gather primary, initial data that could be used to identify a particular question for a more extensive study (Fahy, 2013). This study was not designed to produce detailed data from which any conclusions could be drawn but simply to be exploratory (Fahy, 2013). This type of research can be used for initial program implementation so that information, such as the study's population, the environment in which the study takes place, the people involved in the programming, and the state of programming before

the new study, can be prepared before the primary investigation (Barrett, 2018). Because my study investigated a piloted program, the results can be used to drive more research and therefore further the program's implementation.

Once the question has been identified and the primary type of case study method has been selected, the researcher will need to begin designing their case study approach (Yin, 2018). To obtain a full, detailed picture of the participant or small group, the researcher can use a variety of approaches and methods to collect data (Yin, 2018). These approaches may include interviews, field studies, protocol or transcripts analyses, direct participant observations, a review of documents and archived records, and an exploration of artifacts (Ponelis, 2015). The artifacts in my study are described in Chapter 4. Given the above explanation of exploratory case study design, my study took on that definition. My study incorporated four cases comprised of 10 students, which were compared on qualitative dimensions to portray variation in insights and nuances about the problem under study (Creswell & Plano Clark, 2018). As Miles et al. (2020) described, the descriptive profiles of the cases provided detailed information, thus offering a realistic picture of the medical students' perceptions. This design incorporated individual student interviews and the collection of archived data related to student performance. The combination of these data helped build each case and provide data for individual and intercase themes.

### ***Single Case Study Design***

Whether holistic or embedded, single case studies can be invaluable when the single case is exploratory in nature (Yin, 2018). A single case represents a single experiment; one will need to know if they are doing a single case before collecting data. By determining single case, one will be looking at a single case, one person, one school, and one district, with the key word being "one," which equates to the single case. This type is also a qualitative statistical approach to

research because one is looking at one scenario. Single-subject studies are starting to appear in evaluation more and more (Kennedy, 1979). A single-subject study can be more generalized to introduce the possibility for further research (Kennedy, 1979). This idea of generalizability is why it is essential to make sure your cases have validity, and that is explained in the case.

### ***Multiple Case Study Design***

The same case study can cover multiple cases and draw a single set of cross-case conclusions (Yin, 2018). Utilizing multiple studies can increase the study's value to be stronger than a single case study. When utilizing multiple case study approaches, one should follow replication rather than sampling logic (Yin, 2018). My study utilizes this multicase design given that I identified four cases to investigate and cross-compare. I utilized surveys and follow-up interviews to collect data (Deogan, 2013). The results are described in detail in Chapter 4. Table 1 presents a data source chart.

**Table 1***Data Source Chart*

Question	Document	Data analysis
What are participating students' perceptions of the supports available from the MTSS system as they progress through the program?	Interview questions distributed via Qualtrics with follow-up Zoom interviews	Thematic coding
How do student perceptions of MTSS support compare among students receiving differing levels of support (Tier 1, Tier 2, or Tier 3)?	Interview questions distributed via Qualtrics with follow-up Zoom interviews	Thematic coding
What are students' perspectives on the effectiveness of the MTSS model to promote them as medical students?	Interview questions distributed via Qualtrics with follow-up Zoom interviews	Thematic coding

*Note.* \*Thematic coding done with interview responses to identify patterns to create top rated themes. MTSS = Multi-tiered system of supports.

**Role of Researcher**

I have over 13 years of experience in medical education. I am the first-born child of two immigrant parents, who struggled to provide for our family while attempting to receive their own education. The schools my siblings and I attended were low quality and had poor graduation outcomes. I have always struggled educationally, whether it be in K–12 or higher education. Yet, I was always able to support others in their learning, which drew me to my learning specialist position in medical education. It was there that I had official on-the-job training in cognitive learning and mentoring. I am a leader in my field and continue to produce best practices in supporting medical students educationally and professionally. Due to my struggles in finding my

career, I can relate to the struggles many medical students are presented with, especially feelings of imposter phenomenon. I am best qualified to conduct this study because of my experience, and I was able to implement the pilot MTSS programming. I work closely with medical students to help them be successful in medical school. Stake (1995) identified that one of the roles of a researcher conducting case study research is that of an advocate or facilitator. I often find myself as a student's advocate if one of them has been less than successful in their years of education. I have worked closely with the up-and-coming research on medical students with disabilities and continue to give a voice to those students through this type of study. By making these voices heard, many who struggle in medical school can be inspired and motivated to make healthcare impacts. My experience in the field provided an insider's perspective on supporting medical students while also allowing me to listen to and let the participants speak in their own words.

### **Participant Selection**

This implementation of the MTSS model in medical education was a pilot study. Given this study's uniqueness, the sample size for this study was 10. Participants in this study were medical students with disabilities graduating in the classes of 2022 and 2023. Purposive sampling, students who have characteristics of what I wanted to sample, was used to identify the sample for this study (Miles et al, 2020). A key feature of MTSS models is to monitor all students; therefore, a selection criterion was designed to identify possible participants. All medical students in the two cohorts were being monitored, and as soon as any student met selection criteria for support, they became eligible for participating in the study.

The first criteria in selecting participants for this study was to identify medical students with disabilities and/or those who were struggling academically. The second selection criterion was to identify students with disabilities who received academic support through Tier 1, Tier 2,

and Tier 3 interventions, respectively. These academic supports or tier interventions are described later in Chapter 3. In sum, 20 possible participants of two cohorts, were identified to participate in the study based on disability and scores on modules and exams. Of the 20 students originally invited to participate, 10 students agreed to participate. Ten students were included in the study, and based on the MTSS support they received, they were grouped into four cases for analysis. Table 2 offers a description of how participants were grouped into cases.

**Table 2**

*The Students, Class, Disability Diagnosis, Tier Support, and Group/Case of Participants*

Student	Class	Disability diagnosis	Tier support	Group/case
Student 1	2023	First year med school	Tier 1	CASE 1
Student 2	2022	First year med school	Tier 1	CASE 1
Student 3	2023	Prior to med school	Tier 1	CASE 1
Student 4	2022	Prior to med school	Tier 1	CASE 1
Student 5	2022	Prior to med school	Tier 2	CASE 2
Student 6	2022	First year med school	Tier 2	CASE 2
Student 7	2023	Prior to med school	Tier 2	CASE 2
Student 8	2022	Second year med school	Tier 2	CASE 2
Student 9	2023	First year med school	Tier 3	CASE 3
Student 10	2023	No disability	Tier 2	CASE 4

### **Tier Determination**

- Most students (80%) can adapt to their education environment without extra supports; these students maintain being in Tier 1 of the MTSS support model (Fuchs et al., 2012). Tier 1 students maintaining 75% or above remained in Tier 1, receiving universal support provided globally to all students. These supports entail strong classroom instruction,

group tutoring sessions, weekly quizzes, counseling, and access to academic support services.

- Roughly 15% of students may require additional support to adapt to a learning environment; these students are brought to the Tier 2 supports of the MTSS model. Tier 2 students were identified if they scored below 75% on any given exam or overall final grade. Individual learning plans are created with the student and progress is monitored by support faculty.
- Students who need the most amount of support usually make up 5% of an educational environment's population; these students need advanced support in Tier 3 of the MTSS model. Tier 3 students were identified if they scored below a 70% on any given exam or overall final grade, which resulted in failure of the block. A "block" is the course/class the students take, like quarterly semesters. Remediation plans are created and progress is monitored by support faculty and a student progress committee.

Demographic data on the participants were also collected. Information including known or unknown disability, age, home location (urban, suburban, or rural), socioeconomic status, and gender were gathered (see Table 3 for a description of the participants' demographics within the cases). If accommodations for a disability were given to the student due to identified ADA disability, those accommodations are described.

**Table 3*****Participants' Demographic Data***

Student	Known or unknown disability diagnosis	Age	Gender	Low SES
Student 1	Disability diagnosed: First year med school (ADHD)	25	M	Yes
Student 2	Disability diagnosed: First year med school (ADHD)	25	F	Yes
Student 3	Disability diagnosed: Prior to med school (Epilepsy)	25	F	No
Student 4	Disability diagnosed: Prior to med school (physical vertebrae damage)	28	M	No
Student 5	Disability diagnosed: Prior to med school (ADHD and diabetes)	25	M	No
Student 6	Disability diagnosed: First year med school (ADHD)	22	M	No
Student 7	Disability diagnosed: Prior to med school (stutter, depression/anxiety)	25	M	Yes
Student 8	Disability diagnosed: Second year med school (TBI, ADHD/PTSD)	41	F	Yes
Student 9	Disability diagnosed: First year med school (ADHD)	28	F	Yes
Student 10	No disability	27	F	Yes

*Note.* ADHD = Attention deficit hyperactivity disorder; PTSD = Posttraumatic stress disorder; SES = Socioeconomic status; TBI = Traumatic brain injury.

In summary, I attempted to recruit enough students to develop four groups/cases that had identified each group as having three participants of individual students. However, after recruitment of the students was complete, the cases/groups were not able to be split into four groups/cases of three. Therefore, the groups/cases were adjusted to still be able to develop the

four groups/cases but varied in participants within cases. Cases 1 and 2 had four participants each and Cases 3 and 4 had one participant each. Cases/groups were determined by the type of tier intervention the student was given. Students receiving similar levels of intervention were grouped into one case. The grouping allowed for cases to be compared within and across cases.

### **Setting: Description of the Medical School Program**

Medical education curriculum can vary per institution. Globally, medical students matriculate into their medical education in August of their first year (Bonasso et al., 2015). Their first 2 years typically consist of basic science course works, which range from biochemistry and anatomy to systems-based pathological sciences. At the medical school where the study was conducted, the class of 2022 entered medical school in August of 2018. The medical school's curriculum started off with one-on-one intakes with all 70 student members of the entering class and the learning specialist. These one-on-one intakes are designed to identify students' learning preferences, discuss previous educational experiences, ask how they take notes, and discuss time management. Through these intakes, the hope is that students will disclose disabilities, or the staff member conducting the intakes will identify students who have already diagnosed or possibly undiagnosed disabilities. With this information, the medical school can help students access resources needed faster before they experience a failure. For the students participating in this study, these intakes occurred prior to the students starting their first day of medical school.

Next, students completed a 2-week prematriculation program, which introduced the students to a curriculum that would help enhance them academically, socially, and professionally prior to starting their graded course work. Instead of a 5-month semester system, students took an exam at the end of a specific basic science block, which ranged from 4 weeks to 12 weeks of instruction and testing. Students must successfully pass 10 blocks:

1. Block 1: Foundational Sciences
2. Block 2: Cardiovascular, Respiratory, and Renal
3. Block 3: Gastrointestinal System, Reproduction, and Endocrine
4. Block 4: Musculoskeletal System
5. Block 5: Neurosciences
6. Block 6: Foundations 2: Microbiology and Immunology
7. Block 7: Whole Body
8. Block 8: Cardiovascular, Respiratory, and Renal II
9. Block 9: Gastrointestinal System, Reproduction and Endocrine II
10. Block 10: Neurosciences and Human Behavior

Students then completed their basic science curriculum in the spring or summer of their second year, in which they moved into their USMLE Step 1 dedicated study period. The USMLE Step-1 exam is described in Chapter 2.

Once students took their USMLE Step-1 exam, they transitioned into the clinical curriculum of their education. This transition occurred in the summer after their second year. They completed a range of clinical courses from public health to intense surgical rotations. In each of these rotations, students were evaluated and given a standardized National Board of Medical Examiners (NBME) subject exam to determine their tiered grade for these courses. The tiered grade is honors, high pass, pass, or fail. Upon successful completion of their clinical core rotations, students took their USMLE Step-2 exam. During this time, students compiled elective credits, secured letters of reference, and applied for their desired residency programs.

In the spring of their final year, students were “matched” into a residency in March. Medical students graduated in May and moved on to their new careers in the medical fields they

matched into. Every moment of a medical student's 4- to 5-year journey is high stakes because the career is demanding and stressful. Students bring many life experiences prior to entering medical school and develop even more while moving through the curriculum. Medical school is not easy for even the top-performing students let alone those who face barriers like those students with disabilities. Table 4 details the calendar or sequence of the medical education program.

**Table 4***Calendar or Sequence of Medical Education Program*

Year 1	
Basic sciences	<ul style="list-style-type: none"> <li>• Cell biology, biochemistry, normal physiology of organ systems, anatomy, &amp; histology</li> <li>• Little pharmacology &amp; pathology</li> <li>• Human behavior (bio-psycho-social-spiritual aspects of medicine)</li> </ul>
Practice of medicine (POM)	<ul style="list-style-type: none"> <li>• HPI (history of presenting illness), physical exam (learn how to do full head-to-toe physical)</li> <li>• Fall semester</li> <li>• Multiple actor patient encounters, w/ fourth year or faculty in the room assessing your history and physical (H&amp;P)</li> </ul>
Preceptorship	<ul style="list-style-type: none"> <li>• Spring semester</li> <li>• Get paired w/ a physician to see patients and learn how to present patients you see</li> <li>• Apply what you learned in POM</li> </ul>
Blocks	<ul style="list-style-type: none"> <li>• 1 (general principles), 2 (heart, lung, kidney), 3 (GI, repro, endo), 4 (MSK), 5 (neuro)</li> </ul>
Year 2	
Largely pathology & pharmacology w/ light review of normal physiology	<ul style="list-style-type: none"> <li>• Microbiology, immunology, diseases by organ systems, drugs &amp; bugs</li> <li>• Similar block scheduling to Year 1</li> </ul>
ACS (advanced CS)	<ul style="list-style-type: none"> <li>• Difficult patient encounters, further learning exam skills, &amp; graded encounters w/ actor patients</li> </ul>

<p>Preceptorship</p> <p>Study plans guided by “weekly to-do’s” so you know what material to cover.</p>	<p>Fall preceptorship (similar to Year 1)</p> <ul style="list-style-type: none"> <li>• Provided multiple resources through the school, and highly recommended ones to purchase.</li> <li>• Also have power points (PPT) and some video recordings from years past.</li> <li>• I.e.: “Read pages 70-92 in first aid, watch these videos on boards &amp; beyond, review these lectures/recordings from this professor; &amp; here are supplemental resources if you require more help”</li> </ul>
<hr/> <p>Year 3</p> <hr/>	
<p>“Clerkships”: 4–12-week rotation in a specific specialty</p> <ul style="list-style-type: none"> <li>• Internal medicine: 8 weeks</li> <li>• Neurology: 4 weeks</li> <li>• Pediatrics: 6 weeks</li> <li>• OB/GYN: 6 weeks</li> <li>• Surgery: 8 weeks</li> <li>• Selective: 4 weeks</li> <li>• Psychiatry: 6 weeks</li> <li>• Family medicine: 6 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Didactic lectures, online modules, simulations, mandatory question bank completion</li> <li>• Clinical work: inpatient, outpatient, procedures</li> <li>• Subjective evaluation by clinicians</li> <li>• Shelf examination: administered by NBME at the end of each clerkship.</li> </ul>
<p>“CRIM”: Critical reasoning in medicine course, longitudinal</p>	<ul style="list-style-type: none"> <li>• Required monthly classes to discuss error reduction, clinical reasoning.</li> <li>• Step 2 CS prep course</li> <li>• Involves standardized patient encounters.</li> </ul>
<hr/> <p>Year 4</p> <hr/>	
<p>Mandatory 36 weeks of electives total</p>	<ul style="list-style-type: none"> <li>• At least 32 weeks of electives + 4 weeks rural rotation</li> <li>• No more than 6 of the required 36 weeks may be nonclinical electives.</li> </ul>
<p>Away rotations</p>	<ul style="list-style-type: none"> <li>• 12 weeks away</li> </ul>
<p>Rural rotations (4 weeks)</p>	<ul style="list-style-type: none"> <li>• Rural rotations</li> </ul>
<p>Residency interviews</p>	
<p>Teaching opportunities</p>	<ul style="list-style-type: none"> <li>• POM, ACS, anatomy lab, scholarly concentration, SOC</li> </ul>

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Match Day: third week March

Graduation: mid-May

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Note. GI = Gastrointestinal ; MSK = Musculoskeletal; NBME = National Board of Medical Examiners; OB/GYN = Obstetrics and Gynecology; SOC = Student Outreach Clinic .

### **Description of MTSS Programing**

The MTSS model was implemented in Block 1 for the 2018–2019 academic school year at a western region medical school. Monitoring the class of 2022 started in the summer of 2018 with meetings between admissions and pipeline coordinators and directors along with the learning support teams. These meetings aimed to specifically discuss students who might need interventions sooner and would possibly be “at risk” for difficulty in medical school.

Starting in August of 2018, the Intervention Assistance Team (IAT) and Professional Learning Community (PLC) biweekly meetings started. The learning support team met with all 71 entering freshmen during the prematriculation immersion program. During this time, students completed intake forms in which some of the specific students who were identified were looked at more closely. The PLC team then met right after the prematriculation program the week before the start of Block 1 to discuss students who could remain potentially “at risk” from observations made during prematriculation programs. Risk factors considered were financial pressures, family life, psychological history, progression through pipeline programs, academic struggles, or professionalism issues. These students were monitored throughout Block 1 until the first exam.

The IAT’s duties were as follows: monitoring core instruction and intervention integrity and establishing a feedback system regarding instructional integrity. The core individuals on this team provided the IAT’s structure and met biweekly to discuss the PLC’s progression and intervention outcomes. The PLC met weekly to discuss student progress. The PLC made the

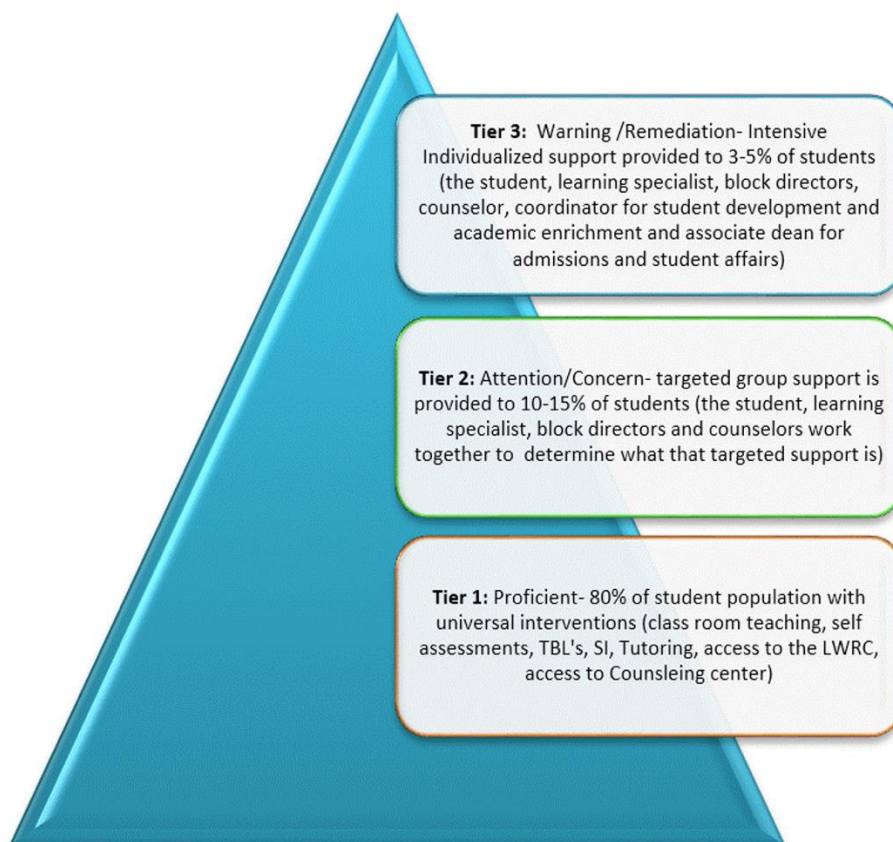
determination if students needed to move up or down the “tiered system” based on performance. Tiers were determined by the number of “concern letters” students received from a given exam performance.

1. Tier 1: Proficient- 80% of the student population
2. Tier 2: Attention/Concern- 15% of the student population
  - a. Attention- One letter of concern (75% or below on an exam)- PLC consists of the learning specialist, block directors, coordinator of online assessment, and a counselor. Point of contact will be the learning specialist who will work with the other members to develop a plan for the student.
  - b. Concern- Two letters of concern- PLC consists of a learning specialist, block directors, coordinator of online assessment, and counselor with heavier intervention.
3. Tier 3: Warning/Remediation- 5% of the student population
  - a. Warning- Three or more letters of concern (but no failures)- PLC consists of a coordinator for student development and academic enrichment, learning specialist, block directors, coordinator for online assessment, and counselor.
  - b. Remediation- Failure of a Block- PLC consists of a coordinator for student development and academic enrichment, learning specialist, block directors, coordinator for online assessment, counselors, and an associate dean for admissions and student affairs.

\*The student was involved in every tier as part of the PLC.

At this medical school, MTSS was designed for medical students to provide academic support when they struggled with parts of the medical school curriculum. MTSS is not a wait-to-fail model, but rather a supporting, immediate way to provide students with support before they

fall too far behind. Students identified for MTSS supports can receive interventions at three different tiers, as can be seen in Figure 2. Tier 1 consists of universal interventions for all students in medical school, which include but are not limited to, classroom teaching, self-assessments, team-based learning, supplemental instruction sessions, one-on-one tutoring, and access to academic support and counseling.

**Figure 2***Conceptual Framework of MTSS*

*Note.* Conceptual framework of MTSS demonstrating intensity of services increasing as students move up the tiers; services can be academic; language; or social, emotional, or behavioral services. Tier 2 supports were targeted and individualized for students. The interventions consist of working closely with learning specialists, block directors (teaching faculty), prescribed one-on-one tutoring, and counseling offices. Tier 3 supports become even more individualized for students by utilizing similar interventions provided for Tier 2 students (learning specialists, counseling, and one-on-one tutoring) along with the monitoring supports of higher administrators such as the associate dean of student affairs and the student promotion and conduct committees. LWRC = Learning and Wellness Resource Center; SI = Supplemental Instruction; TBL = Team Based Learning.

## **Implementation of MTSS Programming**

The implementation of the MTSS model was as follows. First, all students were made aware of the MTSS process as part of orientation. The hope was that students would not be surprised when tier-level intervention was provided or recommended. Second, all medical education students were monitored after completion of the 10 modules and about 12–15 exams. Third, if students scored below 70% as an overall grade in a block or below 75% on an exam, they were referred for extra tiered support.

Monitoring was done by the academic support team, with scores being accessed through the curriculum office. If students scored below a 75% on any given exam, they were placed in Tier 2 supports and given individualized interventions. If students scored below a 70% overall in each module, which classified them as not passing that module according to the medical school rules, they were then placed in Tier 3 supports. These students were affected by COVID-19 shutdowns in March of 2020 when they entered their USMLE Step-1 study phase. After that, their medical school journey would be different than previous years (The class of 2019 was the last class in the nation to have a “normal” medical education). All students during the 2020 year were heavily monitored and actively reached out to while studying for Step 1 because their study period was abnormal. COVID required sheltering at home and shutdowns for all schools, study spaces, and many other locations. Because we were not seeing students in person naturally by physically being at work, we decided to be more intentional with our remote reach-out to maintain consistent communication with students during the Step-1 period. The Step-1 study period is stressful during normal circumstances, so when the pandemic limited students’ abilities to study in places like quiet libraries or study rooms, we knew this would be challenging. Many

students tended to isolate during this time as well, so we continued to heavily monitor the students to prevent the increased opportunity to isolate due to the shutdowns.

### **Data Collection**

To provide a detailed, rich, and triangulated understanding of the perceptions of students' experiences with the newly implemented piloted MTSS model, the following pieces of data were collected.

- a. **Artifact data:** Artifact data included students' academic profiles, school-based documents of reports of the MTSS model, school-based evaluations, and supplementary materials. Artifact data were analyzed through ethnographic content analysis. Ethnographic data are usually collected through observations and interviews. In this case, the ethnographic data came from the interviews with the individual students to draw conclusions of their perceptions of MTSS.
- b. **Survey data:** Survey data from 10 medical students were collected. The survey questions were the interview questions developed by myself and my committee. Each of these students selected received MTSS supports at different stages of the tiered model.
- c. **Interview follow-up data:** Interview follow-up data from the same 10 medical students were collected to complement the survey data.

### ***Collecting Artifact Data***

Upon securing the participants for this study, a procedure for gathering archived artifacts for each participant was developed and completed. The medical school also released data via a secured release process. Artifact data included the following:

- Students scoring 70–75% on any given exam to be identified for Tier 2 or 3 supports.
- Students' intervention plans and progress-monitoring profiles

- Students' Year-1 intake data profiles
- Students' Step-1 planning intake data profiles

### **Interview Procedures**

The interview questions were open-ended to allow for organic conversations. Interview questions for the students were developed through the approval of my chair and committee. See Appendix A for interview questions. Interviews were appropriate for this study as they are targeted and focus directly on the case study topics (Yin, 2018). Interviews were conducted to gain a holistic overview of the context under study with the perceptions of students within the cases. Being able to get the narrative from the interviews allows for a process of deep attentiveness empathetic understanding and suspension or bracketing of perceptions about topics under discussion within the interview questions (Miles et al., 2020). Semi-structured interviews with the students were conducted in an individual Zoom room to avoid possible distractions.

### ***Interview Questions***

I asked participants the following interview questions:

- What was your experience regarding your disability and education before medical school?
- How did you feel about faculty support during the inventions?
- How did you understand the MTSS model and supports?
- Did you feel stigma in disclosing your disability? How was the stigma taken away if you felt like it was?
- What barriers did you feel you faced and how do you think MTSS supports impacted those barriers?

- How did the skills you obtained from interventions assist you in your standardized exams and clerkship performances?
- How will you use these skills in your future profession as a doctor of medicine?
- Is there anything else you would like to tell me?

The survey questions were developed in Qualtrics to continue the security of student feedback. Students were emailed individually and their participation in the Qualtrics survey indicated their consent to being in this study (see Appendix B for the survey and interview protocol and consent form). Zoom in-person follow-up interviews were also scheduled with each student who participated in the Qualtrics survey as a follow-up. Institutional Review Board was approved in exempt form. Data-release documentation was approved by the school's legal team to access student-grade data information.

### **Recruiting Participants**

After Institutional Review Board approval and developing the survey questions with my chair, I started recruiting participants for my study. I utilized secure email and emailed each student individually to ask them to participate. I emailed 20 students in hopes that 12 students would consent to participate in the study. Out of 20 students who were emailed, six students consented to participate. The other students did not respond to the recruitment email and therefore did not participate in providing feedback. I suspect that this was because the stigma of being a student who struggles is still strong and even though students were receiving support, they did not want to disclose any possible identifying feelings. Due to these circumstances, an additional 20 students were emailed, and another four students consented to participate, totaling 10 participants in this study.

Following each interview, I independently transcribed each participant's survey and interview and began to analyze the results. Afterward, I utilized classmates within my doctoral program to code the transcriptions and results for the interreliability of the data being coded. Once I collected the interviews, they were coded and categorized. Both my classmates have since graduated and received their doctoral degrees, both in special education and disability studies. They have experience in qualitative data collection and coding. They have experience with K-12 RTI supports, and one had experience teaching in higher education. Their experience and time continued to be invaluable to me during the data analysis process of my study.

### ***Data Management***

Qualtrics was used to manage survey data from my secure research account, which was through my doctoral program. Follow-up interviews were conducted with my school/work Zoom account as well and recorded for transcription purposes within the cloud. All access was within the umbrella of a higher education institution. Data were compiled within one Excel sheet for a centralized location to find data. The transcriptions were kept in a secure location to which only I had access. Each interview response was reference coded and linked to its subsequent research question.

### **Transcription**

#### ***Phase 1***

Following each survey and interview, I independently transcribed the data. Transcription allows for "the conversational interaction between two physically present persons to eventually become abstract and fixed in a written form" (Kvale & Brinkmann, 2009, p. 177). This was done to preserve accuracy and develop a closer relationship with the data. Transcribing my own data prevented a gap in time for processing and helped me better prepare for all 10 interviews (Rubin

& Rubin, 2012). Precise transcribing methods (Rubin & Rubin, 2012) were utilized to maintain accuracy. Stalling words, phonetic pronunciations (when appropriate), silences, pauses, and hesitations were included and noted. Typically, body language and gestures are also observed, yet this was limited because the interviews were conducted via Zoom. Any detail that could influence the interpretation of the data was noted and included to promote the highest level of accuracy.

### ***Phase 2***

Data were obtained in the system by taking responses from each student, which were collected and placed into an Excel sheet under the question asked. Three individual raters looked through the Excel sheet and identified themes to prove interrater reliability for the interview responses. Member checking was conducted by sending the students who participated in the study their survey and interview responses via email.

### **Data Analysis**

Interpreting the data and, “analysis involve making sense out of what people have said, looking for patterns, putting together what is said in one place with what is said in another place, and integrating what different people have said” (Patton, 1990, p. 347). Following each meeting with every participant, I organized and transcribed the interview data to compare with their survey responses. I utilized an Excel sheet with their survey responses to each question, and within each response I added narratives from the Zoom interviews into that cell using bold font. Once I completed combing survey responses with additional interview narratives, I started thematic coding by highlighting common words within each question. When done with the first run-through of finding themes, I went through the data set again to remove uncommon themes. Uncommon themes would be words I highlighted once, as there would not be enough

representation of that word to constitute a theme. I then took the themes I highlighted and my two other raters highlighted and organized them per question. From that organization I was able to code the themes and compare between students.

### **Coding Reliability**

Responses for each student were collected and placed into an Excel sheet under the question asked. Three individual raters looked through the Excel sheet and identified themes to prove interrater reliability for the interview responses. Overall themes and individual responses are described below. Research question answers follow the case responses.

### **Permission**

Interview questions were developed and imported into Qualtrics to guarantee their security. Each student was emailed individually asking for them to fill out the survey and follow-up with an in-person Zoom session. Each interview lasted between 30 minutes to 1 hour. Overall themes and individual responses are described below. Research question answers follow the case responses.

### **Limitations**

There are several limitations to this study. This study was conducted at a single medical school in the western region of the United States with a small student population. Thus, the findings are not generalizable to other medical schools in different regions with different student populations. Participants were sampled purposefully. Because there was no random association in choosing participants, the findings cannot be used to compare. Contributions of participants were also limited; as can be seen, the initial recruitment size was small and those students who agreed to be part of the study made the sample size even smaller. Students who were identified in Tier 3 supports might have not agreed to participate because they were no longer in the medical

school system. The third limitation was my location in being able to interview the participants was limited to Zoom and not in-person.

### **Summary**

This study method focused on case studies and their relation to qualitative methods research. A case study was defined, and an exploratory design was explained and given an example. Embedded case studies may rely on holistic data collection strategies for studying the main case and then call upon surveys or other quantitative techniques to collect data about the embedded subunit(s) of analysis (Miles et al., 2020; Yin, 2018). In this situation, further research is embedded in case study research (Yin, 2018). The explanation of qualitative method case study research and new program implementation at one medical school has utilized this method to explore students' perceptions.

## CHAPTER FOUR

### Results

Chapter 4 explains and summarizes the findings of the data collection described in Chapter 3. The purpose of my dissertation was to understand the persistence of medical students with disabilities and how to best support these students along with all students. The case study looked at a small number of medical students who have gone through the pilot MTSS program at a western state medical school. Due to some limitations, 10 students were recruited to be interviewed instead of 12 as originally planned. The interview feedback was very insightful and rewarding regarding the MTSS model's benefits.

Interview questions were developed and imported into Qualtrics to guarantee their security. Each student was emailed individually and asked to fill out the survey and follow-up with an in-person Zoom session. Within the Qualtrics survey, the students were asked to indicate their name so I could know which student answered the survey. Each student filled out the same questions. Figure 3 displays an example of the Qualtrics platform students saw.

### Figure 3

*Example of Qualtrics Platform That Students Saw*

After students filled out the Qualtrics survey, I reached out to them to schedule their in-person virtual interview. Each interview lasted between 30 minutes to 1 hour. Responses for each student were collected and entered into an Excel sheet under the question asked. Three individual raters reviewed the data in the Excel sheet to code the data to ensure interrater reliability for the interview responses. Overall themes and individual responses are described below. Answers to the research questions follow the case responses. Figure 4 presents an example of the written notes and notes inputted into the Excel sheet.

**Figure 4**

*Example of Written Notes and Notes Inputted into Excel Sheet*

StartDate	Distributio	Q1	Q2
Start Date	Initial	What was your experience regarding your disability and education before medical school?	How did you feel faculty support during the interventions?
4/4/22 10:04		Felt a little uncomfortable at times, like I was getting special treatment that I maybe didn't need.	Secure and taken care of

### Research Questions

The following research questions guided this case study:

RQ1: What are students' perceptions of the supports available from the MTSS system as they progress through the program?

RQ2: How do students' perceptions of MTSS support compare among students receiving differing levels of support (Tier 1, Tier 2, or Tier 3)?

RQ3: What are students' perspectives on the MTSS model's effectiveness to promote them as medical students?

### General Data Collection and Method

Students were invited via email to participate in this study. The email included the written invitation and link to a secure Qualtrics survey. By filling out the Qualtrics survey, the students agreed to participate in the study and allowed me to schedule a follow-up Zoom interview. The interview was led by the answers the students gave in the Qualtrics survey. Twenty students were

invited by email to participate, and 10 students agreed to participate. Students were recruited from the Classes of 2022 and 2023. Five students from the class of 2022 answered the Qualtrics survey and were invited to participate in a follow-up Zoom interview. Five students from the class of 2023 answered the Qualtrics survey and were invited to participate in a follow-up Zoom interview. The Zoom follow-up interviews were not recorded to ensure the students' privacy.

Detailed handwritten notes were taken with each student interview. Notes were taken on a variety of types of paper and labeled Q1, 2, 3 to mirror the question numbers on the Qualtrics survey. After logging off Zoom with each student, I typed my notes into the Excel sheet that was generated from Qualtrics to combine the two narratives from the students (see Figures 3 and 4).

### **Questions Presented in Qualtrics Survey**

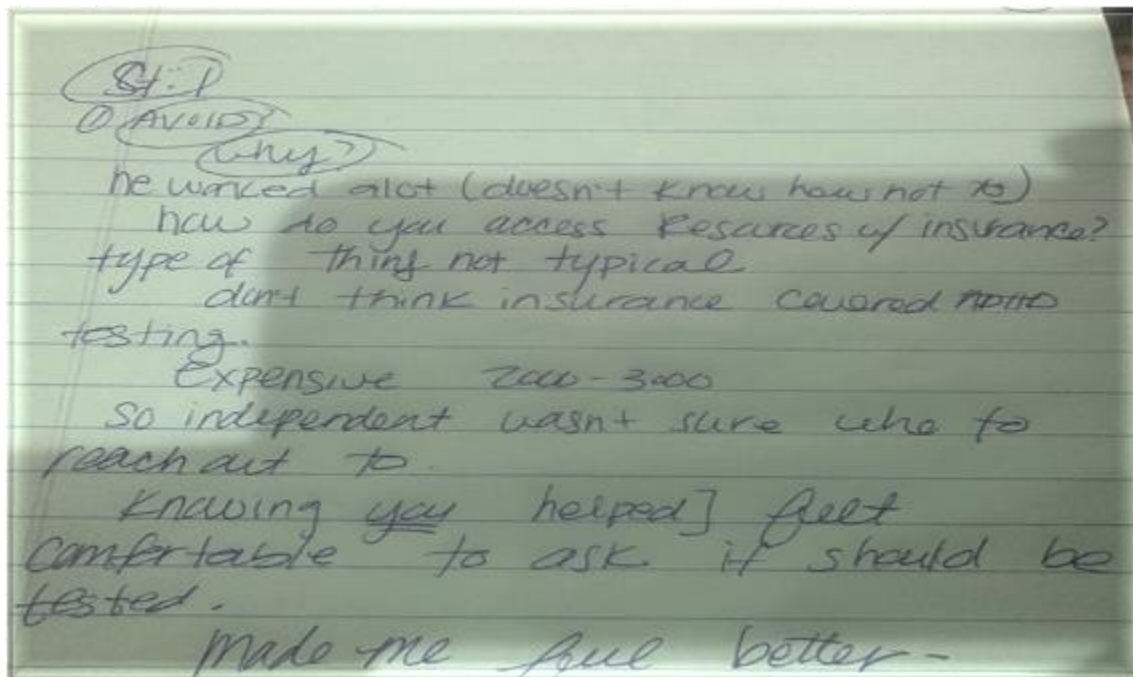
The following questions were presented in the Qualtrics survey:

- What was your experience regarding your disability and education before medical school?
- How did you feel about faculty support during the inventions?
- How did you understand the MTSS model and supports?
- Did you feel stigma in disclosing your disability? How was the stigma taken away if you felt like it was?
- What barriers did you feel you faced and how do you think MTSS supports impacted those barriers?
- How did the skills you obtained from interventions assist you in your standardized exams and clerkship performances?
- How will you use these skills in your future profession as a doctor of medicine?
- Is there anything else you would like to tell me?

Qualtrics delivers data in an Excel format displaying the question asked and responses from participants. Participants had to identify themselves by indicating their name, and all answered the survey questions robustly. The survey was conducted digitally; paper copies were not used to download and code data. Qualtrics alerts the researcher when a participant has filled out the survey so the researcher can check the responses. Collecting survey responses took place during the summer of 2022. After the responses were received, I emailed the students again (specifically replying to the original email sent) and invited them to a follow-up Zoom interview. All students responded and agreed to a Zoom interview. The Zoom platform allowed me to interview the students remotely while I was in another state. Utilizing the same questions presented in the Qualtrics survey, I spent 30–60 minutes with each student to gain more insight into their responses. Figure 5 presents an example of the handwritten notes.

### Figure 5

#### *Example Handwritten Notes*



I added notes to the survey responses within the Excel sheet in a different color font (blue). I utilized digital formats rather than paper for better security. After completing the follow-up interviews, I spent 2 months coding the verbal feedback. Once coded and themed, I sent the results to the students a year later for their information. Verbal feedback came from the feedback from the Zoom interviews.

### **Primary Participants**

Ten medical students who had experiences within the pilot MTSS support model participated in the study. Originally, one student did not identify with having a disability, but at the conclusion of the data collection, all students indicated they were diagnosed with a protected disability. The students' names in the study are pseudonyms to protect their identity. The students' ages ranged from 21–27 years of age at the time of matriculation.

### **Setting**

The study was conducted via virtual platforms with the initial email notification through all students' secure school emails. The Qualtrics survey link was embedded in the email, and Qualtrics is also a secure electronic platform. The interviews were conducted via Zoom through a secure platform from the students' institution. Interviews were conducted via Zoom through the student's institution, to which I had some affiliation. As described in Chapter 3, the students were enrolled in a medical school in the western United States. Below are descriptions of the cases for students who were in Tiers 1, 2, and 3. Students are identified by indicating Student 1, 2, etc. and their quotes are utilized in response to comments.

### **Case 1: Tier 1 Students with Disabilities**

As described in Chapter 3, Tier 1 is a category for UD in which all students start in Tier 1 and are given the same opportunities for support programming. The students in Case 1

maintained their status in Tier 1, which means they did not have any academic markers from their exams to place them in a higher tier. Because this dissertation focuses on medical students with disabilities, these students were chosen because they had indicated that they have a disclosed disability. The students chosen for Case 1 indicated they had a disclosed disability and did not have any academic difficulty, which would have placed them in Tiers 2 or 3.

Of the students who were emailed and agreed to participate, four were Tier 1 students with disabilities. These students overall avoided disclosing or asking for help regarding their disability. For example, Student 1 (S1) indicated in his Qualtrics survey results that he knew something was going on with him, but avoided addressing it because he did not have insurance. S1 is a first-generation college student who comes from an underrepresented minority background. He has worked his whole educational career and is a nontraditional student because he is over 25 years of age. S1 indicated that he always struggled academically, but always thought it was because he was balancing a lot while being in school. When I interviewed him over Zoom and asked him to elaborate on that, he stated, “well...I was working but my insurance did not cover testing for ADHD, and it was too expensive to pay out of pocket.... I also didn’t know who to talk to or find support...” The students felt supported once they did reach out for help to support them receiving accommodations for their specific disabilities.

Student 2 (S2), who graduated with the class of 2022 and was also diagnosed with ADHD during their first year of medical school, indicated in their Qualtrics survey that they could not be happier with the amount of support provided by the school’s staff. S2 is also a nontraditional student due to being over the age of 25 and is married. At the end of S2’s medical school journey, she became a mom. She is also a first-generation college student and decided to go to medical school as a career change; she was a practicing nurse prior to matriculating into

medical school. School and life always seemed to be difficult regarding her time management and focus; she always assumed it was “normal” to feel scattered. Like S1, when I did her Zoom interview, I asked her to elaborate on that statement. S2 said:

Well...I always knew that I had ADHD I just never had the support to ask or know where to go. I actually learned about how to reach out to you from a friend who received testing and support from you. So, I knew then that I could reach out and you would help. It was a relief to know that someone was there...and most of all did not make me feel bad about asking or seeking out whether I had ADHD or not.

The students did not understand the MTSS model or system fully, as Student 3 (S3) stated in her Qualtrics survey that she was not sure what the MTSS model stands for. S3 had a different educational and personal background from S1 and S2. S3 was also married but came from a privileged background in which she was able to have access to high-quality healthcare to determine her disability status. She is not a first-generation college student and played sports in college. However, because of the supports she was given as a student athlete, she never fully utilized disability services in her education until medical school. During S3’s Zoom interview, I asked her the same question that was on the Qualtrics survey: “How did you understand the MTSS model and its supports?” They indicated, “oh yeah...I did not understand that question, what was MTSS?” I described what the model was to them and that they learned about it during their immersive orientation prior to starting first year. She indicated:

Oh...I think I remember that...but wasn’t aware that a model was there to help support students in regard to disabilities, I guess I just associated everything with your name and not an actual framework. I did not know that the support model had a name or that it was the same thing...

The interventions the students found most helpful were speaking with faculty who were experienced in working with students with their profiles and tutoring. S1 elaborated on the support he received:

By working with a learning specialist, I was able to see that I am a hands-on learner. And being able to have access to testing accommodations. I needed to be free from distractions to be able to perform best on an exam. In going back to being a hands-on learner, I think that is why my clinical rotations have gone so much better, I am not just staring at a screen anymore.

The students felt stigma in disclosing their disabilities, yet many asserted that the stigma was self-induced. For example, S1 said, “Yeah, I felt stigma towards myself. I felt sad that I wasn't normal, and I wish I was. I realized I was better at other things because of my disability so it didn't feel like a disadvantage anymore.” Additionally, S2 said:

I was reluctant to report my ADHD because there certainly was stigma surrounding it. After reporting it and the school faculty were involved in helping me navigate medical school despite of it, I can report that I felt less stigma as the time passed. This was mainly due to the nonjudgmental and empathetic approach that faculty took in helping me.

Tier 1 students with disabilities also mentioned the barriers of the NBME application process to receive accommodations for their board exams. Student 4 (S4) is a nontraditional student and was a nurse prior to matriculating into medical school. S4 had a different disability status than the other students in Case 1. His disability was physically related in which he had a clear understanding of what he needed to do to accommodate himself, yet he did not fully know that he needed to register for services so he could continue to best get those supports. Similar to some of the other students in Case 1, he was in a long-term relationship and had his wedding

while in medical school. S4 said, “I think the biggest barriers were standardized testing, but you were able to get me accommodations in my school and board exams, which helped greatly.”

Student S4 said, “NBME makes it extremely difficult to receive accommodations for licensing exams. The assistance I received from the school was incredibly helpful in navigating the process.”

Some of the biggest experiences the students said they will take with them are knowing themselves better now and knowing they did better on their exams once they received supports for their disability. Illustrating this point, S3 said, “I went from failing my practice exams to scoring 12 points higher once I tested. My clerkship scores have been stronger because I am more aware of what study style works best for me.” Students spoke very highly of those they interacted with within the MTSS model and are thankful for their support. For example, S1 said, “you really helped me a lot and I owe you everything. I wouldn’t be here if you hadn’t pushed me to get help and I really appreciate it” and S4 said, “I felt very supported through my nonclinical years and beyond. I believe that the faculty supportive and understanding. My greatest anxiety was getting approved for Step accommodations and with the help of faculty everything worked out swimmingly.”

### **Case 2: Tier 2 Students with Disabilities**

Of the students who were emailed and agreed to participate, four were Tier 2 students with disabilities. Students were placed in Tier 2 if they scored below a 75% on any given exam, so that they would be given extra support to help them go back into Tier 1. Like Case 1, students who were asked to participate who had Tier 2 supports were those who specifically identified that they had a disclosed disability. Three of these four students did not know they had a disability prior to engaging in the tiered process. For these three students, their disability was

either diagnosed or fully realized by the student due to being placed in Tier 2. Student 6 (S6) stated, “I did not know I had a learning deficit prior to medical school, and education was relatively easy.” S6 is a younger student who has pressure from family to become a physician. He was always highly functional yet known for being “all over the place” and just thought that was who he was. He comes from an educated familial background and is not a first-generation college student. During S6’s Zoom interview, I asked them what they meant when they said school was relatively easy, and they replied:

I always did well, I graduated high school top of my class, did well on the SAT, got into college right away, took the MCAT once (though I think I was on the low end) and got into medical school on the first try. I was always hyperactive, but everyone was like “oh that’s \_\_\_\_\_,” turns out I was compensating. I always felt less than even though I was still excelling.

Like the students in Tier 1, the students in Tier 2 felt supported by faculty, yet one student indicated that they felt they were not understood. Student 7 (S7), the student who felt they were not understood, said, “I felt heard but not understood. Not at the fault of the learning specialists, but it was difficult for me to hone down on a system that worked for me throughout medical school.” S7 is a nontraditional student who is an underrepresented minority. He is a first-generation college student with financial insecurity from a different state. He always worked while he was in college, and being in medical school was the first time he was not able to have a financial income to help support himself. He did not have the easiest path getting into medical school, and he always felt he was “less than,” which caused him to be very independent in his path of education. He always had a stutter, but always thought his struggles academically were because he never had the educational resources growing up. Given his academic struggles,

coming to terms with his cognitive disability took some time. Though he had a stutter all his life, he was not aware of his depressive/anxiety/ADHD impairments. He became aware that his struggles academically all his life were due to his depressive and ADHD symptoms. There was a lot of stigma and lack of resources around S7 with his stutter growing up, such that looking into the cognitive side of his learning was not an option. During the Zoom interview with this student, I asked him to elaborate on his statement of not being understood, and he said:

I knew you would ask about that...I just think that who I was working with did not know how to work with my mind. I am complicated and tend to always be skeptical of any kind of help. So, I felt that I kind of wasted my time trying to work with them, again no fault of their own, I am just a complicated case...and I know that.

When asked if they understood the MTSS model, just like their peers in Tier 1, the Tier 2 students with disabilities said they did not have a full understanding of what MTSS was or that the support model they were using was called that. Student 8 (S8) indicated that “I didn't even know what MTSS was, just Googled it.” S8 is an older, English-as-a-second-language student and an immigrant. Her educational background was primarily from a different country and not the United States. Her college education was in the United States, yet being the age she is and an immigrant, she always assumed her struggles in learning were due to her background. It was not until the end of her first year, with her consistent academic troubles, that she was referred to cognitive testing. During this time, she was diagnosed with a variety of disabilities along with the realization that she had brain injuries as a child in her country. Discovering all that happened to her was traumatic and hard to deal with while in medical school during the COVID-19 pandemic.

Tier 2 students with disabilities found that tutoring was the most helpful intervention. This group utilized tutoring services more than the Tier 1 students (all were given a tutor as part of their intervention plan). Student 5 (S5) indicated, “tutoring and testing accommodations were the best interventions that I received.” S5 is the first of his family to go to medical school and was fortunate enough to have a parent who was a teacher for special education services through the K–12 system. Yet he did not seek services for his disabilities until his postbaccalaureate program. Even with having access to disability resources, he still felt reluctant to utilize these services while in medical school. When he was placed in Tier 2 after his first exam, he became more open-minded to applying for the services and was eventually able to be placed back into Tier 1.

Tier 2 students with disabilities experienced stigma when disclosing or coming to terms with their disability. S8 stated, “I had to face my own stigma. We all want to be normal and not need extra help. I never felt stigma from faculty but somewhat from peers, but I just don’t give a shit.” Interestingly, S7 stated that:

I felt no stigma in disclosing what was happening to me with the learning specialists. I feel like the learning specialists took what I said, ascertained my expectations, and helped me see what options for me to get there, such as using tutoring and resources for medical school.

Learning how to adjust how they learn and develop their new learner identity was something students indicated as being their biggest barrier, along with applying for accommodations through the NBME. S5 stated, “I had a hard time relearning to study and through tutoring and support improved a lot.” S6 stated that “the biggest barriers were standardized testing, but the faculty were able to get me accommodations in my school and board

exams which helped greatly.” S8 had a different experience when applying for standardized exam accommodations, saying, “The major, maybe the only, true barrier was to get official accommodations for the USMLE exams. I had a massive amount of support and still, it was not approved.” These students’ experiences illustrate the variation when seeking accommodations for high-stakes exams, which is not equal among those who apply.

Students found the behavioral skills (such as time management) to be beneficial and something they will take with them into their role as physicians. S5 specifically stated, “this really helped with time management and having to complete exams, having extra time on exams. Time management is one of the most important things I learned from this process.” Like the Case 1 group, these students indicated their appreciation for those who supported them with the MTSS model, yet they would have liked to have been heard more during the process.

### **Case 3: Tier 3 Students with Disabilities**

Of the students who were emailed and agreed to participate, only one qualified for this category. Students are placed in Tier 3 if they have failed a course and require intensive monitoring. As stated previously, students were recruited based off the fact that they were in Tier 3 support and had a disclosed disability. Upon interviewing this student, Student 9 (S9) noted that she appealed her grade. Her grade appeal was approved and therefore she no longer qualified for Tier 3 placement. She was dropped into Tier 2, yet her case was not described in the Case 2 group because she was originally identified as a Tier 3 student. Her themes are like those above, and she also indicated that more resources are needed for a model like MTSS to continue to be successful. Some examples that S9 gave to help MTSS be successful was someone to oversee and continue the programming, more financial resources to support student tutoring and administration help, and reminders that the programming exists and is there to help students.

S9 came into medical school as a nontraditional student. She was 26 when she matriculated, which is on the older end of students accepted. She is the first of her family to go to medical school and has always been independent in all aspects of her life, including her education. She struggled throughout her schooling and when studying for and taking the MCAT exam. She was homeschooled during her K–12 education and therefore did not seek any cognitive testing. When she entered medical school, she knew she should consider seeking testing for attention deficit disorder. She was diagnosed 2 months after the start of medical school. S9 said, “I was aware of resources but had never used them myself.” When asked why she did not utilize the resources, she said, “I didn’t think I qualified, I honestly didn’t know to look, or ask.” I also asked her about her experience with being placed in Tier 2 and Tier 3 as part of the follow up to her response to the intervention question on the Qualtrics survey. She disclosed that she was not placed in Tier 3 because she did pass the block. She said, “I think I had only one small intervention with a repeated neuroanatomy lab practical, I found that to be a good experience I didn’t require any other faculty intervention.” S9 indicated that she felt somewhat uncomfortable asking certain faculty for help after one who was supportive left. She felt more comfortable working with peers than seeking support through any other avenue (she was in the class of 2023).

S9’s understanding of MTSS was also limited. When asked how she understood the model, she indicated, “to be honest not very well, and I’m not sure where that even stands at the school at this point. I got the big picture but not the details.” In her follow-up interview, she indicated that the support model seemed to have been placed on hold at the end of the spring of her second year. The biggest help she felt she received was through tutoring:

Professional tutoring through a paid service was the most helpful, as they have the skill and expertise. I felt that peer-to-peer tutoring with an incredibly neurotypical person made me feel even worse. I reached out a lot to you and another resource for support, which was helpful.

Like the other students in this study, S9 felt stigma. As she put it,

Haha, I don't think that will ever fully go away. I willingly disclose my ADHD and in doing so, have had several upcoming students ask me for help or mentoring since we have similar experiences. I wish I had that when I was diagnosed, and I continue to be open about it so folks know me as someone who can help them or just understand it.

S9 accessed disability accommodations through her school and attempted to apply for standardized exam accommodations. She said:

The NBME is the epitome of evil, so there is no way anything can help with that even though they try. I don't think MTSS is very structured or noticeable at the school so it's hard to know how it may or may not have helped with barriers.

Ultimately, S9 experienced a lot of self-discoveries in accepting her ADHD as part of her identity and wanting to continue to advocate for others. She indicated that, "I would definitely like to see more neurodivergence in medicine and will continue to advocate for this and self-disclose my diagnosis as appropriate to do so."

#### **Case 4: Tier 2 or 3 Students Without Disabilities**

Case 4 was developed to receive narrative information from students who did not have a disclosed disability but needed to receive Tier 2 or 3 supports due to academic difficulty. Of the students who were emailed and agreed to participate, only one qualified for this category, Student 10 (S10). When S10 was placed in Tier 2 for academic support as a first-year student,

she did not present with having a disability, just academic struggles. Yet that aspect changed when I collected her data. In S10's third year of medical school, she was struggling on her standardized clerkship exams and was referred to disability services, where she qualified for services. More information came out during S10's in-person interview. Tutoring services were one of the biggest interventions that S10 found to be beneficial. Her experiences are like those in Cases 1–3. She finally received a diagnosis of attention deficit disorder and anxiety when she was in her third year of medical school. For all the students in this study, medical school was always a dream, and they were all so thankful to finally be fulfilling that dream. However, S10 always assumed that she faced barriers in medical school because of her background. The fear of facing barriers was a similar experience for students in the other case studies.

S10 is a first-generation English-as-a-second-language student. She was in her mid-20s when she started medical school and did not have any family who went to college, let alone medical school. Her path to medical school was a rough one, yet she successfully matriculated in 2019. She has always struggled with school, yet she associated those struggles with English being her second language and her learning curve being “slow.” S10 was placed in Tier 2 during her first year of medical school, yet she never sought testing for possible disabilities. Looking into this was never something she considered, and therefore she never utilized or knew of these resources. She was always open to support from faculty and was always appreciative. When asked about MTSS, she left that question response blank on the Qualtrics survey, so I asked her about that during our Zoom interview. She indicated that she left it blank “because I did not know what that was, so I did not answer.” She went on to say, “I do remember you reaching out first year to offer more support but did not know that was called MTSS.” S10 indicated that getting connected with disability resources was one of the best interventions she was able to use.

She also utilized tutoring during her first 2 years of medical school. During her third year, a faculty member suggested she seek out accommodations, and that is when she did. She said, “I was hesitant to contact the DRC at first, however after talking with the staff they made me feel better when it came to reaching out for help.” Because of having these services, she was able to pass the rest of her clerkship exams. She did not indicate any skills that may help her in the future.

### **Cross-Case Analysis**

I conducted a cross-case analysis by looking at the combined survey answers and interview transcripts through interpretive methodology and constant comparative analysis (Glaser & Strauss, 1967). I took the first-level coding from each case and focused on similarities and differences across the cases. Table 7 has each research question paired with Cases 1–4 in which similarities and differences are highlighted for each research question within each case. When survey and interview responses were combined in one Excel sheet, I went through each response and highlighted themes in blue. For example, I went down the whole column and highlighted certain words like *uncomfortable*, *did not know*, *avoided*, and so on for the first interview question, “What was your experience regarding your disability and education before medical school?” The term “not know” came up six times out of the 10 responses, therefore I would consider that to be a common theme. My co-raters did this same method with purple and red highlights. Once I received all the color codes, I placed all the themes in a separate tab to get a more concise picture of the themes in one place. The reason for this method was it was visually easier to find the colors of the common word themes, and having everything in one Excel sheet with clearly identified tabs was helpful to see the data in one place. Then I took all the themes and separated them into their four case groups side-by-side with the color themes still

highlighting the words. From there I was able to identify similarities and differences across the cases:

**Common themes across all four cases:**

- Students felt uncomfortable disclosing their disabilities.
- Students felt faculty support was appropriate as they navigated medical school through support systems.
- Students did not have a good understanding of the MTSS support model and its offerings.
- Most students felt stigma disclosing their disability.
- Students' main barriers were with standardized testing (NBME)
- Students' disclosure of their disabilities allowed for constant engagement with learning specialists.

**Table 7**

*Cross Case Analysis by Research Question*

Research questions	Case 1 Tier-1 students with disabilities	Case 2 Tier-2 students with disabilities	Case 3 Tier-3 students with disabilities	Case 4 Tier-2 and 3 students without disabilities
Q1: What are students' perceptions of the supports available from the MTSS system as they progress through the program?	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt faculty support was appropriate as they navigated medical school through support systems.</li> <li>students did not have a good understanding of the MTSS support model and its offerings.</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt faculty support was appropriate as they navigated medical school through support systems.</li> <li>students did not have a good understanding of the MTSS support model and its offerings.</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt faculty support was appropriate as they navigated medical school through support systems.</li> <li>students did not have a good understanding of the MTSS support model and its offerings.</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt faculty support was appropriate as they navigated medical school through support systems.</li> <li>students did not have a good understanding of the MTSS support model and its offerings.</li> </ul>
	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>Positive experience</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>test-taking issues prompted students to ask for help.</li> <li>less positive experience</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>less positive experience</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>less positive experience</li> </ul>
Q2: How do students' perceptions of MTSS support compare among students receiving differing levels of support (Tier 1, Tier 2, or Tier 3)?	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt uncomfortable disclosing their disabilities.</li> <li>most students felt stigma disclosing their disability, students' main barriers were with standardized testing (NBME)</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt uncomfortable disclosing their disabilities.</li> <li>most students felt stigma disclosing their disability, students' main barriers were with standardized testing (NBME)</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt uncomfortable disclosing their disabilities.</li> <li>most students felt stigma disclosing their disability, students' main barriers were with standardized testing (NBME)</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>students felt uncomfortable disclosing their disabilities.</li> <li>most students felt stigma disclosing their disability, students' main barriers were with standardized testing (NBME)</li> </ul>
	<p><b>Different:</b></p>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>test-taking issues prompted students to ask for help.</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>test-taking issues prompted students to ask for help.</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>test-taking issues prompted students to ask for help.</li> </ul>

Q3: What are students' perspectives on the MTSS model's effectiveness to promote them as medical students?	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>disclosure of their disabilities allowed for constant engagement with almost all the students who agreed to participate.</li> <li>students indicated that being patient with themselves as they navigate this new identify of themselves is also important.</li> <li>Time management is an area that is difficult for a lot of students in general, yet it is even more difficult for students with disabilities. Continuing to learn how to learn, knowing about accommodations, and most of all, knowing their limits were key takeaways for the students.</li> <li>Thankful for the designated faculty who helped them.</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>disclosure of their disabilities allowed for constant engagement with almost all the students who agreed to participate.</li> <li>students indicated that being patient with themselves as they navigate this new identify of themselves is also important.</li> <li>Time management is an area that is difficult for a lot of students in general, yet it is even more difficult for students with disabilities. Continuing to learn how to learn, knowing about accommodations, and most of all, knowing their limits were key takeaways for the students.</li> <li>Thankful for the designated faculty who helped them.</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>disclosure of their disabilities allowed for constant engagement with almost all the students who agreed to participate.</li> <li>students indicated that being patient with themselves as they navigate this new identify of themselves is also important.</li> <li>Time management is an area that is difficult for a lot of students in general, yet it is even more difficult for students with disabilities. Continuing to learn how to learn, knowing about accommodations, and most of all, knowing their limits were key takeaways for the students.</li> <li>Thankful for the designated faculty who helped them.</li> </ul>	<p><b>Similar:</b></p> <ul style="list-style-type: none"> <li>disclosure of their disabilities allowed for constant engagement with almost all the students who agreed to participate.</li> <li>students indicated that being patient with themselves as they navigate this new identify of themselves is also important.</li> <li>Time management is an area that is difficult for a lot of students in general, yet it is even more difficult for students with disabilities. Continuing to learn how to learn, knowing about accommodations, and most of all, knowing their limits were key takeaways for the students.</li> <li>Thankful for the designated faculty who helped them.</li> </ul>
	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>More indicated that they received NBME accommodations</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>Indicated that they learned about themselves more.</li> <li>Reframed their mind that their disability is not a deficit.</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>Indicated that they learned about themselves more.</li> <li>Aim to support those who struggled like them.</li> </ul>	<p><b>Different:</b></p> <ul style="list-style-type: none"> <li>Indicated that they learned about themselves more.</li> <li>Did not apply for NBME accommodations.</li> </ul>

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- Aim to support those who struggled like them.
  - Two students received NBME accommodations . One applied and was rejected, appealed, and was still rejected. One did not apply for NBME accommodations
  - Did not apply for NBME accommodations
- 

One main difference that stood out between Case 1 compared to Cases 2–3 was that students in Case 1 did not experience academically difficulty. These students were in Tier 1 of the MTSS model but identified as having or were diagnosed with a disability while in medical school. Students in Cases 2–3 experienced academically difficulty, which is why they were placed in either Tier 2 or 3 and provided extra supports through the MTSS model. Because of this difference, most Case 1 responses were positive regarding the interaction with the model. The feedback from students in Cases 2–3 were more critical regarding their perceptions or feelings towards the initial support. Students found certain supports like tutoring and test-taking strategies to be most helpful. Students indicated that the initial reach-out to provide those supports with support felt appropriate, yet the students felt a sense of being “less than” when the reach-out happened. The students in Cases 2–3 indicated the growth they developed while in medical school. The students indicated that they had a better understanding of their identity and how to function, especially given that some discovered they had a disability, which aided them in being able to be successful in their clinical rotations and beyond. Case 1 students did not

describe their growth as much through the continuum. Overall, the students in all cases felt the model was helpful to them, yet they could not correlate to certain aspects of the model.

In comparing the medical education MTSS model to the K–12 model, the tiered structure is effective in that students were being provided disability support services while maintaining Tier 1 status. Those in Tier 2 were able to gain learning and disability support to be moved back to Tier 1. Because of the ability measure student progress when placed in Tier 2, students were placed back into Tier 1 if they showed strong academic progress. For example, if a student was placed in Tier 2 due to being below a 75% on an exam and with Tier 2 supports their next exam was an 80% they were placed back into Tier 1 for regular monitoring. Students indicated that they gained time management and personal growth skills from the interventions they received.

The biggest area of concern was the Tier 3 students who did not respond to participating in this study. In the K–12 system, Tier 3 students would be in “special education” or alternative classrooms; from this study, those in Tier 3 in medical education did not complete their schooling due to not having an alternative way of instruction.

## **Summary**

Chapter 4 presented descriptive findings from an exploratory qualitative case study at a western medical school and focused on students’ perceptions of an MTSS support program. Case study primary participants were 10 medical students from the Classes of 2022 and 2023. Overall, students’ perceptions of MTSS supports were positive, yet they did not have a clear understanding of what MTSS was. One student indicated that they needed to look up the term prior to filling out the survey. Once the concept was explained, the students understood what the terms were. This suggests the name of the support programs must be made clear to the students along with all who are implementing the program. Students seemed to have a clearer

understanding when discussing the person who was supporting them, rather than the big-picture model.

The students' perceptions in Tier 1 and Tier 2 supports were positive, yet there were undertones of irritation from the students when discussing the tier levels with them. Students who experienced Tier 3 supports either did not agree to participate in this study or expressed negative feelings towards the supports they received. Students in Tier 3 supports had a higher risk of repeating or being dismissed from the program, therefore stakes and pressure for them were higher. Many of the students who were in this Tier 3 category either are still struggling or are no longer in medical school.

As stated in the first research question, most students expressed positive perceptions of the MTSS model, and they felt their promotion of their medical education was positive. Many indicated that they would take these skills into residency and their practice as physicians. Out of the 10 students on this study, 9 students matched into their top residency programs while 1 will match in 2024 due to completing a dual master's degree. A common theme was that the program will have trouble with sustainability if there are not more resources to support the program and therefore support them as students.

Overall, more work must be done to evaluate and better structure an MTSS program in medical education. The framework can work, as can be seen by the 9 students who successfully matched into residency programs, but more students must be studied among other types of curricula in professional schools and higher education. Chapter 5 presents a detailed analysis of these findings as well as the conclusions drawn from them and recommendations for future research and practice.

## Chapter Five

### Discussion

The purpose of this dissertation was to understand the perceptions of 10 medical students with disabilities regarding their experiences in a new academic support system. Currently, there are no other MTSS models in medical education available for review or comparison. The study was driven by three research questions:

RQ1: What are students' perceptions of the supports available from the MTSS system as they progress through the program?

RQ2: How do student perceptions of MTSS support compare among students receiving differing levels of support (Tier 1, Tier 2, or Tier 3)?

RQ3: What are students' perspectives on the MTSS model's effectiveness to promote them as medical students?

Overall, even with a close relationship with an advisor or faculty member, students were still uncomfortable discussing their disability and resources. These results are consistent with those of Martin et al. (2020) and Meeks (2016), who highlighted the stigma surrounding disability disclosure. What did help students, even with the consistent feelings of stigma, was that once they disclosed and were supported, they felt safer about disclosing. Students indicated that some of their views on stigma were towards the fear of what their peers were going to think and taking medications. Often students are unsure about being prescribed certain medications—for depression or ADHD, for example—that can be of great assistance to them because they feel they must disclose those to medical boards.

One of the most promising outcomes from the study was that the students were thankful and felt very supported by the certain faculty who supported them. This person was a first point

of contact to work with all students upon entry into medical school. This role may vary from institution to institution but having a designated point of contact for students has been promoted by current areas of literature (Keller, 2022). One student quoted, "Mary did a wonderful job initiating and guiding me through my initial presentation. She was also very thorough and persistent during Step 1, and I can definitely thank her for that." Another student kindly indicated:

You was the one who recognized that I had an issue that needed to be addressed, because of you I will suffer less for the rest of my life and will be able to help more people. The effect of your care and efforts will affect many lives thru the students you help and their patient. I know you know the impact of this. Forever grateful. Hugs!!

The students' narrative statements and ultimately their success show that being attentive and persistent with supporting students is valuable to the student (Keller, 2022). Having that well-trained professional is important.

Students in the Case 1 group had a more positive experience than those in Cases 2 and 3. As a reminder, Case 1 participants were all Tier 1 students, meaning they were never placed in an advanced tier due to academic struggles, yet the students did have a disclosed disability. These students' positive outcomes aided in better well-being opportunities for them, hence their positive remarks during this study (Martin et al., 2020). The students who disclosed their disability indicated that they felt supported by their faculty and peer mentors to know how to navigate their environment with a disability (Martin et al., 2020).

The support of a knowledgeable faculty member in this study confirms previous findings that having a support specialist is beneficial to limit the structural barriers for medical students with disabilities to have support during their education (Meeks et al., 2021; Morales & Mata,

2016). In this study, the MTSS model at times discovered hidden disabilities for students who were struggling academically, such as ADHD or cognitive disabilities. The discovery of the hidden disabilities confirms that the model allowed fewer implications if there were outdated policies that did not allow for these students to discover their disability (Meeks et al., 2021). Unfortunately, the study confirmed that there are still types of barriers for students with disabilities in that some of the students in the study took longer to complete their education or did not continue (Meeks et al., 2021). Those students who took longer to complete their education were in Cases 2–3. Even with faculty support, one barrier was the USMLE Step-1 exam, which caused delays in education specifically for a student in Case 2 (Kim, 2015; Petersen et al., 2021). The student example in Case 2 is consistent with the literature in Chapter 2. Many of the comments from the students in the study indicated that they struggled gaining accommodations for the USMLE standardized exam, yet with the support of a disability professional they are more likely to apply and receive some sort of accommodation on these exams (Kim, 2015; Petersen et al., 2021).

### **Limitations**

When this study was created, the original recruiting participant goal was 12 students to be split evenly into the four cases. The population of students would be recruited from the class of 2022. The 12 students would be divided based on criteria that would place them in Cases 1–4, as described in Chapter 3. Because five of the students from the class of 2022 agreed to participate in the study, recruitment was expanded to the class of 2023. The same criteria were applied to place students in the respective cases. This resulted in the mixture of participants from the Classes of 2022 and 2023, who had different MTSS experiences, and students could not be

evenly distributed into case groups as originally planned. The total number of students recruited was 10 as opposed to the original 12.

Starting with a limited number of students to request to be a part of this study was one thing, but having the small numbers in recruiting students for Cases 3 and 4 should be noted. Qualitative research allows for smaller numbers within studies; for example, there are cases of qualitative research that just focus on one individual for the whole study. The students who were recruited for Case 3 who were in Tier 3 either did not respond to the email request or were no longer in medical school, meaning they either dropped out or were dismissed. Thus, recruiting participants for Case 3 was difficult. With qualitative research, having one student with Cases 3 and 4 still allowed for narrative findings of the perception of those students about the MTSS model.

For students recruited for Case 4, those who participated in Tiers 2 or 3 without a disability brought up an interesting story for the student who participated, and one that should be studied further. The one student who agreed to participate ended up being diagnosed with a disability and receiving accommodations during her third year of medical education. Another limitation for Case 4 was that recruiting was unsuccessful because the procedure was done incorrectly when recruiting the original three students for Case 4 from the class of 2022. Students outside of the disability realm were not invited to participate, and they should have been for the class of 2022. For the class of 2023, all students in Tiers 2 and 3 were invited, which is how the one student in Case 4 agreed to participate. There is still an opportunity for more research regarding students who are identified as not having a disability who need extra support while in medical school.

As can be seen in the literature, students with disabilities still require extended time in their medical education curriculum (Searcy et al., 2015). It should be noted that COVID-19 also affected access for these students, which is another indicator of disparity for this population. Currently, the U.S. population has a reported 28–40% of adults over the age of 18 with mental health disorders, which has been exacerbated by the COVID-19 pandemic (McKnight-Eily et al., 2021). The students in this study were affected by COVID-19 shutdowns in March of 2020 when they entered their USMLE Step-1 study phase. After that, their medical school journey would be different than previous years (The class of 2019 was the last class in the nation to have a “normal” medical education). All students during the 2020 year were heavily monitored and actively reached out to while studying for Step 1 because their study period was abnormal.

At the end of the preclinical years, medical students take the USMLE Step-1 exam to be promoted to their clinical phases. The class of 2022 started studying for USMLE Step 1 in March of 2020, the month the nation shut down due to COVID-19. For this medical school program, USMLE Step 1 is the end of the foundational 2-year science program for medical students. Given the state of the world due to COVID-19, 2020 was a different year for students studying for Step 1. Given the isolating nature of Step 1 and the issues with prometric centers, the medical school faculty and staff maintained consistent communications with the class of 2022 regardless of Step-1 identified risk. Prometric centers are testing centers where individuals take computer-based exams, such as the MCAT, SAT, and USMLE Step exams, to name a few. Prometric centers are testing centers not affiliated with any higher education institution. This aspect was unique and integrated nicely into the MTSS model for all students to be monitored for success. The class of 2023 matriculated in 2019 and participated in all in-person orientation and regular block schedules as the class of 2022. Yet in March of 2020, the COVID-19 pandemic required a

change in the students' block timelines due to not being able to be in person during their Block-5 anatomy lab. The students therefore took a second-year course (Block 6, which is micro and immunology) at the end of their first year instead of their neuro Block 5. Block 5 was rescheduled for the beginning of their second year, along with its lab. Grading for these two blocks was also altered due to the pandemic. Ultimately, the students in the class of 2022 and 2023 who did not have to extend their schooling successfully matched into top specialties and have indicated that they will use the lessons learned from the support model to advocate for individuals like them and to build awareness of how to function in medicine with their disability.

### **Practical Implication/Recommendation for Practices**

Many students did not have a clear understanding of the MTSS model and that the model was meant to support students during their medical school education. It seemed the model was clear for faculty who were identifying the struggling learners and the students were supported individually without punitive consequences with Tier 2 placement. The process, which was outlined in Chapter 3, was clear for identifying struggling learners. How to support the learner individually, remediate students without punitive consequences, and have faculty understand that they must put in the time to help learners were all successful components of the MTSS model (Chung et al., 2019). Yet, though there was a clear understanding for those who were supporting the students, the students themselves did not understand the process, as can be seen by their feedback regarding understanding the MTSS model. If others have similar programming being clear about the supports being offered so students can understand them, similar to “specifications of practice” that each medical specialty has. Looking into the concept of “specifications of practice” can integrate future graduate work to undergraduate medical education to keep the narrative continual.

Therefore, student development for better understanding of the model and its process will be important for further implementation. During orientation phases, a description and detail of the support model must be delivered to students in a classroom, along with the start of every course, and found in policy language for supporting students. This is important because the more students know about the support models and how they work, the more students can possibly disclose and know that they will be supported for the disclosure. Having the support model language expressed throughout the students' studies can also show the collaboration between curriculum and student affairs to promote the concept of holistic student support throughout the continuum (Grieco et al., 2022)

The students who participated in the study expressed the value of the expertise of the people implementing the model. This suggests that other medical schools wishing to implement this model should emphasize professional development for those implementing the model. Training is important to be able to supply professional resources for all students, especially those with disabilities. Having a resource professional is key (Meeks, Herzer et al., 2018; Petersen et al., 2021). Understanding UD is also important. Being a part of AAMC resource groups and the Coalition for Health Science and Medical Education access are also important for all those working in medical education to participate in. Resources and knowledge from professionals implementing the model will be vital.

As discussed above, some students could not be recruited for the study because they were no longer in medical school. This insight raises questions about the path these students take out of medical school. Ellaway et al. (2018) described the off-ramping option in discussing remediation best practices. Medical schools could have an opportunity for off-ramping that works, so students still have an outcome from the time spent in medical school. Without proper

off-ramping schools could still be creating a big barrier for students with disabilities, thus they are unable to complete medical school. The off-ramping options would need to provide career alternatives so students can still be successful even if it is not being a practicing medical doctor (Ellaway et al., 2018).

### **Future Research**

Further research must determine why students are not applying or being given accommodations for USMLE exams. Prior research has already established that students who were granted accommodations for the MCAT exam took longer to finish medical school and had lower scores on the USMLE exams (Searcy et al., 2015). More recently, Petersen et al. (2021) found that students who needed accommodations on the USMLE exams were not getting them; the students were also taking longer in medical school and earning lower scores. However, neither study sought student perspectives. A study surveying and interviewing the students who need these accommodations could uncover why they are taking longer to graduate and earning lower scores from the students' points of view. This study would need to document the disabilities they presented and investigate why they were unsuccessful.

Future studies must explore the experiences and perspectives of students in Tier 3 with a disability (Case 3) and students in Tiers 3 and 4 who did not present with a disability (Case 4). Researchers will have to solve the recruitment problem first. One possible solution would be to leverage the support of school administrators to help with recruiting students who a support specialist would not necessarily encounter and those who leave the program. The perspectives of these students are needed to better understand what these students were missing to be successful in their program. Meeks et al. (2019) also indicated the need for further research on these students so that better documentation and supports can be provided for them.

## Summary and Conclusion

Chapter 5 presented a discussion of findings from this qualitative case study of 10 medical students at a western medical school. This school piloted an MTSS model framed from the K–12 system. Students felt supported yet did not understand the model. Therefore, student development for better understanding of the model and its process will be important for further implementation, along with professional development for those implementing the model. Deeper interactions reduced the incidence of superficial integration, increased the level of understanding achieved, and reduced stigma experienced by students.

The pandemic has exposed disparities in healthcare. Patients with disabilities are one of the patient populations that have healthcare disparities. Currently, disability education for healthcare professionals is minimal. Having physician representation who have disabilities can better healthcare outcomes for our patient population with disabilities. For example, a recent study from 2021 surveyed current physicians indicating that only 40.7% of physicians are confident about their ability to provide the same quality of care to patients with disabilities and that this population is often treated unfairly by the healthcare system (Iezzoni et al., 2021). Another recent study also showed negative views of people with LDs and mental health challenges by healthcare professionals (Ee et al., 2022). These professionals were not comfortable working with people with LDs because they did not know enough about them nor had proper training (Ee et al., 2022). Having physicians who have an understanding themselves about disabilities, because they also have a disability, will create a more understanding physician who can assist in creating more accessible healthcare. Representation matters, and we know from mentorship literature that having educators who identify within a certain diverse population increases trust and comfort.

By having PWD in the workforce we can promote accessible healthcare and education. This accessibility starts in medical school by supporting the entry and retention of students with disabilities. Student support in medical education must continue to be researched and implemented. Previous research has shown that when provided with the proper supports, students, regardless of disability, can thrive like the rest of the population (Meeks, 2018). The students in this study indicated that more support and funding are needed for the models to continue to be successful. When medical schools invest in such programs, students with disabilities succeed, providers with disabilities are represented in the workforce, and individuals with disabilities receive better medical care.

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## Appendix A:

### Interview Questions for Medical Students

Interview Questions:

What was your experience regarding your disability and education before medical school?

How did you feel faculty support during the interventions?

How did you understand the MTSS model and its supports?

What interventions helped you the most and why?

Did you feel stigma in disclosing your disability? How was the stigma taken away if you felt like it was?

What barriers did you feel you faced and how do you think the MTSS supports impacted those barriers?

How did the skills you obtained from interventions assist you in your standardized exams and clerkship performances?

How will you use these skills in your future profession as a MD?

Is there anything else that you would like to tell me?

### **Class of 2022 Student Profile and Other Interview Responses (maybe should be in appendix for more information?)**

Below are survey responses given by the group of 22 students at the end of their Year 1 courses in 2019.

**Measures were exam performance**, overall grade performance, reflective writing assignments, MSPE engagement markers and tier intervention behaviors.

**Interventions suggested to students were** tutoring, weekly monitoring, supplemental instruction (SI), small group review sessions, test taking strategies practice, note taking strategies, work with faculty counseling and disability resource center (DRC) referral.

**Did you have a clear understanding of MTSS?** On a scale from 1-5 majority students answered an average of 3.3 (10 of 22 students responded to the survey. 45%).

**What supports were suggested to you when you received your Tier 2 support letter, and did you find them helpful?** Students spoke highly of tutoring services, disability resource services (such as alternative testing), meeting more with faculty and study groups.

**What interventions did you follow through with?** 4 students indicated tutoring, 4 students indicated DRC services, 3 students indicated working in study groups, 4 students indicated study and testing taking changes, 3 students indicated working with faculty and lastly 2 students indicated counseling.

**We want to best support ALL students at this school- what are some suggestions that you have for us as we continue to improve our system?** Looking other students who have been successful (use their suggestions for studying, note taking and resources used). More counseling services available. Focus social supports. Faculty were awesome- have more faculty available and willing to work with students. More thorough follow-up with students who are struggling (but a fine line with independence). Did not find follow-up helpful, I just do what I need to do and take a break when I can. Going over lectures to gain a better understanding of relevance, being heard. Made available for all students but optional, for example “someone who barely passed a block because he or she was busy and just didn’t have much time to study doesn’t have to make time to have academic meetings when they clearly don’t need them. And on the other hand, a student who maybe gets an 82 in a block but really struggled and can’t believe they passed is able to utilize this support system.”

### **Profile Data Class of 2022**

Overall: (total of 21 students who went through Tier 2 intervention). Causes for students to be placed in Tier 2 were due to scoring below 75% on a given exam (initial structure of testing was

that courses had 1 or 2 exams prior to the overall final exam, this allowed for proactive interventions to occur for students), or if faculty within the PLC/PRC felt that students needed extra support.

**Common themes:**

<b>Tier 2</b>			
Student 1	After first exam in a block	New study strategies and follow-up, completed SA's	From a different city, minority, military
Student 2	Below 75 on exams	Missed assignments	From different city, older, minority, first gen, ESL
Student 3	Below 75 on exams	Late on assignments	Out of state, older, first gen, minority
Student 4	Below 75 on exams		Different city, minority, older
Student 5	Below 75 on exams		First gen, minority (college out of state)
Student 6	Below 75 on exams	Interventions: tutoring, SI, watching videos	
Student 7	Below 75 on exams	Missed assignments	Different city, first gen, minority
Student 8		Resistant	Different city, older, ESL, first gen
Student 9			Different city
Student 10		transition	minority
Student 11		LD	Different city
Student 12		Late	First gen, older, minority
Student 13			Out of state
Student 14		late	Different city
Student 15		CD (ADHD)	Out of state, minority, first gen
Student 16	professionalism	Late, LD	City, minority, first gen
Student 17		Missed assignments	City, first gen
Student 18		DRC	
Student 19		Missed assignments, LD	City
Student 20		DRC	Older student
Student 21			Out of state, older, ESL

Overall progress of extra support students in reaching same performance as the rest of the class. At the end of the preclinical years medical students take the USMLE Step 1 exam to be promoted to their clinical phases. The class of 2022 started studying for USMLE Step 1 in March of 2020, the month that the nation shut down due to COVID-19.

USMLE Step 1 is the end of the foundational 2-year science program for ALL medical students. Given the state of the world due to COVID-19, the year 2020 was a different year for students studying for Step 1. Given the isolation nature of Step 1 and the issues with Prometric centers the medical school faculty and staff maintained consistent communications with the Class of 2022 regardless of Step 1 identified risk. This aspect was unique and integrated nicely into the MTSS model for all students to be monitored for success.

**Class of 2023 Background in comparison to full implemented MTSS model with the Class of 2022:** The class of 2023 matriculated in 2019 and participated in all in person orientation and regular block schedule as the Class of 2022. Yet in March of 2020, the COVID-19 pandemic required a change in the students block timeline due to not being able to be in person during their Block 5 anatomy lab. The students therefore took a second-year course (Block 6 which is micro and immunology) at the end of their first year instead of their neuro Block 5. Block 5 was rescheduled for the beginning of their second year, along with its lab. Grading for these two blocks were also altered due to the pandemic.